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In This Issue—*Turning Shop Losses Into Profits*

MOTOR AGE

Vol. XLII
Number 11

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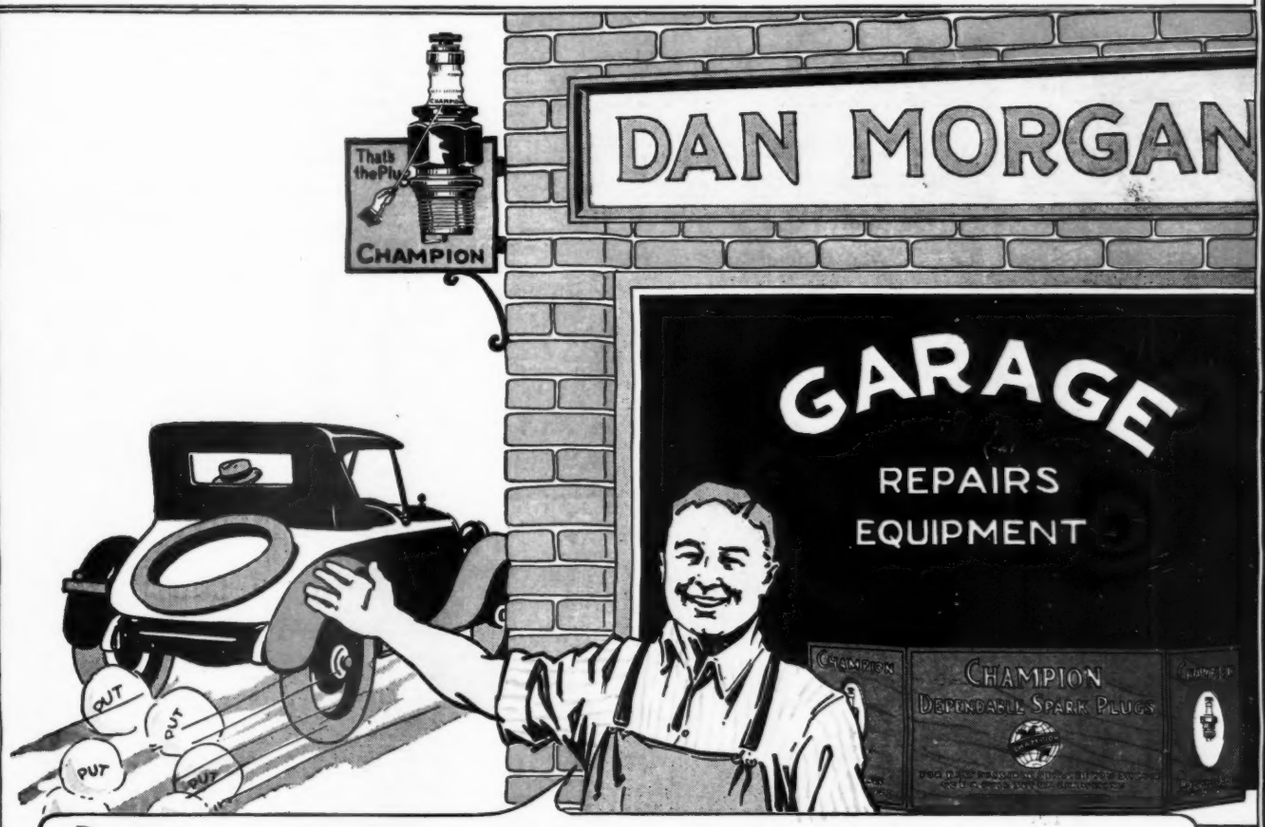
Dan Morgan Increases His Profits



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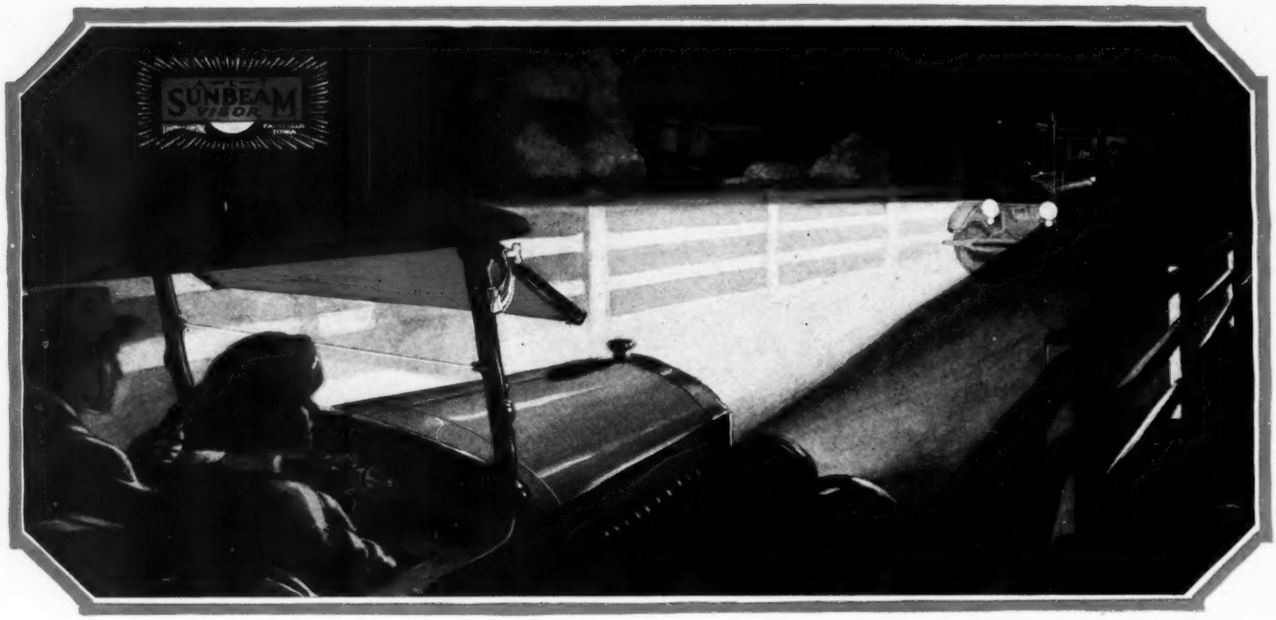

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MOTOR AGE

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Vol. XLII, No. 11 Chicago, September 14, 1922 $3 Per Year

MOTOR AGE

Turning Shop Losses Into Shop Profits

These Suggestions Apply to Practically Every Establishment Where There is a Hope of MAKING MAINTENANCE PAY

By B. M. IKERT

THERE is enough loss in some dealer's maintenance shops at the end of each week that, if it could be converted into dollars and cents, it would pay a fairly decent wage to an additional man in the shop. Sometimes the loss is small and then again it runs into quite huge sums.

The larger institutions are not always the most efficient. In fact, we have seen some examples of gross mismanagement in dealers' establishments located in very large cities. Some of the best managed and most profitable shops are located in small towns. The size of the institution has little to do with its successful management.

Frequently we find a large maintenance department in which, because of the many people employed, the heads of the business get the impression that the place is being run as efficinetly as possible. Their excuse for big expenditure generally is that "our overhead runs pretty high, you see. We have a big place, etc." It is in some of the bigger places that you will see a mechanic using a whole sheet of emery paper, when a quarter sheet would do the job. You will find electric lights burning when there is no necessity for it. A man will get a

handful of cotter pins from the stockroom when two is all he needs. There are dozens of similar instances of shop leaks.

The small shop, too, very often is an offender when it comes to poor management and shop leaks. But in the smaller institution, one generally finds that the losses are of a different nature. Many of the smaller shops, for example, are not tooled up as completely as they should be. The result is that too much time is spent on a particular job. Mechanics do not like to work under poor conditions. Jobs are slowed up; the price for the work mounts rapidly; customers become dissatisfied and sooner or later you find the dealer saying that he does not break even on his shop work.

Why a handful of cotter pins when four or six is all the mechanic needs? What becomes of the rest of the handful? Eventually lost, of course. They may be cheap, but many such losses will mount up in a year's time

He should be making a profit on his shop, because, while it is true that one of the biggest jobs a dealer has is to see that his customers get the proper service from their cars, it is equally true that maintenance of those cars involves shop work that is legitimate in every sense of the word. We do not repair customer's cars these days just to keep them satisfied with the cars they have bought with the hope that there will be repeat sales in the future.

Every dealer, or anyone else engaged in the legitimate work of repairing automotive equipment, has the right to expect a profit on his work. Much of the motoring public is under the impression that the so-called "garage man" makes money hand over fist, yet it is common to have these men tell you that they lose money on many of their repair jobs. The customer has paid a high price for certain work and yet the owner of the shop has lost on the job. Why? Simply because of a succession of leaks in the business from the time of taking in the job until it was delivered.

There are certain leaks in the maintenance departments of many dealers quite difficult to locate. They are of a subtle nature and not nearly so tangible as using twice as much gasoline or kerosene as necessary for cleaning parts, allowing the lights to burn and such wasteful practices. They are the leaks that gnaw at the cash register and often result from the wrong system of handling the work in the shop, or from the dealer accepting a repair job on a car which is just this side of the scrap heap and on which he is sure to lose.

Accepting Too Old a Car

Recently we asked a man engaged in the repairing of cars and trucks, what one thing he tried to avoid in his business in order that shop losses might be reduced to a minimum. He placed at the top of the list the acceptance of cars too old to be repaired. It is quite easy to tell a customer that his old car can be fixed up, but when you get the job torn down and rebuild it with the necessary new parts, the cost will mount so rapidly that eventually the repair bill is out of all proportion to the actual worth of the car.

For example, a car came into the shop the other day and the owner wanted to have it gone over and put into "good" running condition. The man in charge of the dealer's maintenance department did some careful figuring and here is what he found out.

As the car stood, it was worth about $400. It had been driven some 25,000 miles and needed, among other things, the following work: Take up wear in ring gear and pinion; two new universal joints; new clutch throwout bearing; new clutch linings; replace twelve valves with oversize stems; take up main and connecting rod bearings; new high tension wires on distributor; align front wheels and take up play in wheel bearings; new fender; solder radiator; tighten spring saddles and fit four new shackle bolts. And there were a few other things to be done.

When the owner was told that the cost of the work would be around $200, with the possibilities that the job would run higher, he was amazed.

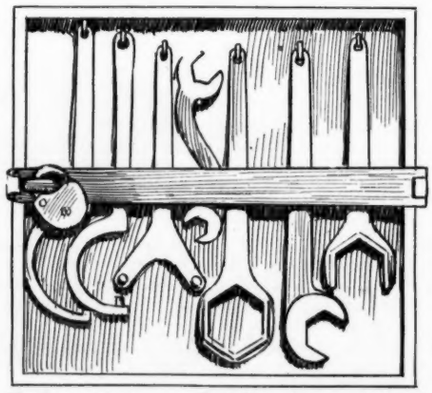
The result was that only the immediate things to make the car run well were done. Had the dealer's man gone ahead and "fixed her up" as the customer stated, the result would have been disastrous for the institution.

The fact that the car is old and therefore relatively cheap, does not cheapen the repairs on it. Any dealer will tell you his shop dislikes to tackle the older model cars. Bolts and nuts are rusted in place on them; springs are "frozen"; everything has to be chiseled off; speed wrenches are out of the question. The job is slowed up in every way and the repair price mounts. The customer will not pay and the dealer is stuck. This represents one of the shop losses that can be turned into profit by either not accepting the job or figuring on only doing the immediate things and at a price which the owner will pay.

Poor Accounting

A maintenance shop may be crowded with cars and customers but unless it keeps records it may be losing money all the time. At any rate it will not be making all the profits possible. No man can keep all the detail of his business in his head. And, the department of internal revenue has said that he must not.

No matter how large or how small the business, the dealer must know at all times where he stands. If he does not, there will be leaks in the business and he will be unable to place his finger on their source.



Tools cost money. It takes the profit from a good many repair jobs very often to replace lost or broken tools. Tools that belong to a certain machine might be kept under lock by the arrangement shown above. The mechanic gets the key from the shop foreman

Bookkeeping simply means putting down the correct figures at certain places in books and doing it at the right time. It is surprising how few dealers can tell you the exact value of their stock of parts. Ask them if their shop is ahead of last year's record and they cannot tell you. Ask them why they charge $1.25 an hour for their maintenance work and they cannot tell you. They are lost when you ask them how they divide "overhead." The truth is, they charge $1.25 an hour because everyone else in the town does so.

The smaller places of business are the chief offenders along this line. This, in the main, is due to the fact that many of the dealers who have started in business originally were mechanics. They know the mechanical end of the business, but balk when they hear the term "bookkeeping." The small place of business easily might arrange with an accountant to work part time.

Such a person often can save hundreds of dollars a year, because he checks the losses, which, though each item may be small, will, when extended over the period of a year, grow surprisingly large. How many men, for example, realize that it takes all the profit earned on a half dozen jobs, perhaps, to pay for a broken reamer? The $1.25 an hour charge is not clear profit and out of it must come the price for new tools to replace those which have been broken or lost, oil which is wasted, and similar unnecessary expenses.

As we said before, your maintenance department may be crowded with work and to all appearances you are making money but unless every transaction is recorded somewhere, and by someone who knows what it is all about, the chances are the profits will be very small and out of all proportion to the volume of work. Profits can only result from maintenance work when there is an accurate recording and charting of the work.

Check Oil, Rags, Etc.

Most large factories of any kind have efficiency experts who try to increase production with reduced overhead. Such men could, no doubt, be kept pretty busy in many of our automotive repair shops.

Under no circumstances should a mechanic be allowed to help himself to rags, oil, grease, tools, and sandpaper, without someone checking the items. Someone must be held responsible for these things. A boy can do it. He can be used for other things in the shop, but he easily might be placed in charge of the stockroom where these items are kept and only pass them out upon a requisition slip presented by the mechanic.

If a mechanic has access to sandpaper, say, he will surely grab a whole sheet, whereas he may need only a piece 4 in. square. Cotter pins, bolts and nuts, are small items but they amount to lot over a year's time, when they are given out in a haphazard manner. A mechanic with a handful of cotters may need but half a dozen, but does he take back the others to the stockroom? No. They are tossed on the bench; some drop on the floor and sooner or later they become lost.

Rags for cleaning are in constant need in the shop, but they should be dealt out judiciously. Material like sandpaper, and emery cloth, preferably, should be bought in rolls. Then the keeper of the stockroom can cut a piece of any desired size from the roll and not be tempted into giving a man a whole sheet when he does not need it. In some of the better managed shops, the foreman O. K.'s the mechanics' requisition slips and knows from the job the man is doing how much of anything he needs.

The grease bucket must not stand unguarded, nor should the oil and kerosene. There must be requisition slips for all this to insure that the material will be charged to the particular job on which it is used. If a customer's car needs a pound of grease, that customer should pay for it. The cost must not come out of the general shop overhead. Put your oils and grease under lock and key and have someone responsible for their distribution.

Valve grinding by hand is still in vogue in many shops. More jobs can be handled per day and more profits result from the use of electric valve grinding tools

In this connection it is not amiss to mention that the oil should be handled efficiently. There are barrel pumps on the market and oil tanks which insure keeping the oil clean and practically prevent waste. Don't store the oil in milk cans or draw it from old-fashioned drums.

Broken and Lost Tools Costly

One of the prolific sources of shop leaks is that of broken or lost tools. Many shops have a ruling that the mechanics must furnish their own tools, the shop supplementing these with special tools and devices. Under these condition the men generally will take care of their own tools and the problem becomes one of watching the shop equipment.

It is an excellent plan to have the same boy or man who watches the supplies also watch the tools and equipment. Some of the more common tools needed might be kept on a rack and protected by a bar and lock, as shown in one of the illustrations. The key for this rack might be kept in the stock room or at the foreman's desk. A glance at the board shows which tool is missing and a brass check bearing the mechanic's number should hang in its place. When he brings back the tool, he removes the check.

One of the surest ways of losing money in the shop is by failure to provide proper equipment. No group of men can do efficient work by working on units scattered around the floor. In the above illustration, for instance, an engine stand would easily turn a loss into a profit

It is not uncommon to find files lying around a bench or floor with other tools striking them, destroying their cutting edge. Cutting tools, like files should be protected. The frequent necessity of having to buy tools eats into shop profits. Dull tools slow up work and eat into a mechanic's time. It is well to have one man take a half day a week to do nothing but grind twist drills, sharpen reamers and similar work.

A little talk occasionally by the foreman or service manager on the question of tools, will help. It may lessen the

chances of a man using a screwdriver as a chisel and pliers in place of the proper socket wrench. Attention to this will produce larger returns on the tool investment.

Value of Proper Equipment

The value of proper shop equipment to speed up production has been pointed out many times in these columns. We, therefore, only want to again emphasizes some of the more important things in connection with shop equipment and its bearing on shop losses.

Take the cost of a mechanic lying on his back and trying to take up a set of connecting rod bearings. He can do it, yes, but he will not do as good a job day in and day out under those conditions as he will with the right equipment to lift the front end of the car or tip it over on its side. There is excellent equipment on the market in the form of cranes or tilting devices that allow a man to get at any part of the car in a comfortable position. Naturally, he works faster and is able to do more work in a given amount of time.

No one can work on a car with nothing but the old fashioned type of monkey wrench. That wrench has its place, but in these days the speed wrenches of the socket type are the only answer. Of course, they might well be supplemented by double end wrenches. One of the best ways to speed up shop work and cut down leaks in time, is to equip the shop with several sets of speed wrenches and ratchet wrenches.

Who has not seen mechanics working on the floor on engines, axles or transmissions? Plenty of examples everywhere. And, it all represents shop leaks. Imagine a man struggling with a 500-lb. engine on the floor, when he could swing it in an engine stand and place it in any position desired. There are excellent engine stands to be had and they are superior to the home-made varieties, but we say if a shop must make its own equipment in heaven's name let an engine stand be the first thing made.

There always is considerable lifting to be done in the shop and for this a crane is the thing. We have seen four men taken from their work and put to work lifting out an engine from a chassis. This is dangerous to men and engine. Suppose they dropped it. It has happened. We recall a shop where a truck engine was dropped because a home-made wood crane gave way. It cost the shop over $100 to repair the engine, which had just been put into good condition. A good crane will cut down leaks by making it safer to handle work and making it easier for the men, to say nothing about the time saved.

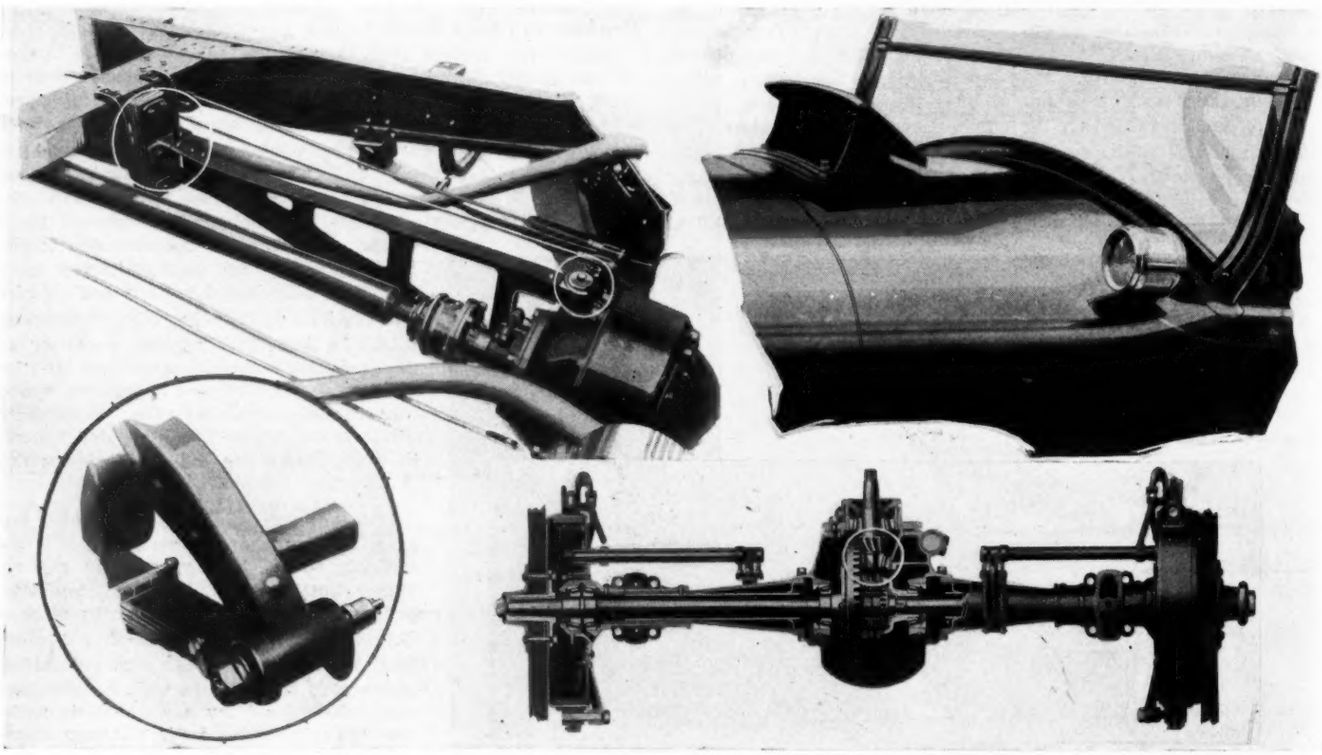
Grinding valves by hand! And in a pretty good sized shop at that. That's what we saw not long ago. There is hardly a shop anywhere these days but what has access to electric current. An electric valve grinder is the answer to leaks resulting in the shop from valve grinding jobs. Along with it should be an electric drill. Bumpers have to be installed and other work calls for drilling a frame and can you imagine the time it takes doing this with a common hand driven breast drill?

Then there is the arbor press. If ever there was a waste of time, which is just another way of expressing shop leaks, it is when a mechanic tries to drive off a pinion or gear from a shaft, or tries to pry off a bearing from a shaft. An arbor press does it in the twinkling of an eye and without damage to the parts. A hammer and chisel is not the thing to use.

The public is getting pretty wise when it comes to repairing automobiles. A customer may not be able to tell your men in the shop just what tools they ought to use but he can tell that your shop is behind the times if he sees a man doing something by hand, which some other shop in which he has been, does by machinery. The customer who possesses mechanical knowledge is horrified and you have just that much resistance to overcome in trying to sell him a car or maintenance work.

Turning shop losses into profits is largely a matter that rests in the dealer's hands. He must watch every move of the business and if the profits' curve of the shop takes a downward course as shown by the records, he will investigate and look for the leaks. He must be in position to get a perspective of the entire business, for only in that way can he intelligently place his hands immediately on the things that are hindering him from making legitimate profit.

Close-Ups of Peerless Chassis and Body Details



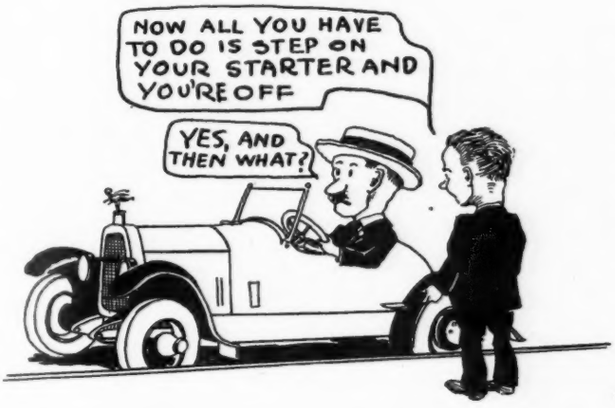
Upper left, the pressed steel torque arm, showing the flexible connection at front end. An Alemite fitting insures lubrication of hinge bolt at the rear, indicated by circle. Upper right, the cowl ventilator and drum shaped side lamps. Lower left, rear spring shackle which has an adjusting means without a cotter-locked nut. Lower right, rear axle section, showing in circle, the bearing back of pinion

What a New Car Owner Expects of a Dealer

This writer was motor wise and finally reached the goal of every American—he became a car owner

I am exactly one month old—as a car owner. Until I took the wheel of the demonstrator about six weeks ago I had never attempted to drive a car.

Dealers and garagemen ought to be interested in me because I am multiplying at the rate of nearly 2000 a day in Illinois alone.



A new owner such as I am, wholly unacquainted with the mechanism and even the principles of automotive construction, has to rely entirely on the dealer for instruction and advice, as well as for maintenance and repairs. I am sure that a good many dealers don't emphasize this point as much as they should and thus lose sales which logically belong to them. Perhaps the manufacturers are partly to blame for the loss of many sales by the smaller dealers, for the factories' alluring accounts of freedom from trouble and low upkeep frequently give the prospective owner the idea that he can buy an "Economical Six," drive it away and live happily ever afterward.

This can be done, of course, by people familiar with the fundamentals of motor cars, but the average new owner requires many a little suggestion and piece of advice which his local dealer can give him when he needs it. When the purchase is made, or for a few days afterward, the situation necessitating this advice may not arise and so it may be overlooked by the big dealer in the city.

I could have saved some money by purchasing through a big city dealer, with whom a friend was acquainted, but as I live about twenty miles from Chicago, I figured that the hundred or so saved would not be worth while if I had to make the trip every time I encountered some little problem or difficulty. I haven't had any serious difficulty thus far, but many a time I've got a little tip from my dealer which has helped me.

Now, I believe my dealer is above average as to plant and equipment, and just about average in his dealings with his customers. He sold me, or, rather, I bought a front and rear bumper, and a lock along with the car, but there are several other items I would have purchased, had he asked me to, such as spotlight, mirror and stoplight. I voluntarily ordered an extra tire and am going to get a tire cover. As I say, I know practically nothing about the car, but I do know these items are almost indispensable to me. I am sure there are other accessories carried by the dealer which I would be glad to have if he would tell me about them. All these things, of course, are perhaps trivial in themselves from the standpoint of profit, but they are sales nevertheless. Why doesn't Mr. Average Dealer go after them and not let the big town department store or cut rate shop take them away from him?

There is another thing I would appreciate from Mr. Dealer, that is, some information concerning the various types of service he is prepared to render me. I know he sells gasoline and oil, but in the rear of his garage, in a section shut off from the car storage place, he has some machinery and mechanics—for what, I don't know. If he would take me through the shop and sales room and tell me something about the accessories he's carrying and about his equipment, and service he is prepared to give I undoubtedly will stop reading department store accessory bargain ads with a desire to stop off while in Chicago and save a few cents or dollars.

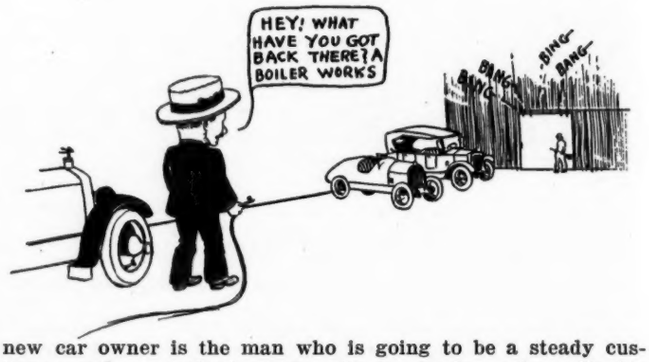
Thus far I've made every purchase for the car from my dealer, but, as I say, it's been principally because I sold myself on the items.

If other car owners, especially new car owners, are like me, they are intensely interested in their cars and will be glad to listen to any advice or information offered. Why doesn't the average dealer cash in on this interest now that it is at such a high point, and by telling us new owners all about his shop and his stock, make us regular, 100 per cent customers?

There is only one thing I have to add to this rambling letter, and that is, if I were a dealer-garageman, especially in a

small town near a big city, I would carry only standard, advertised accessories, preferably those with a uniform price. That would put me on an equal basis with the biggest dealers and the department stores of the city. Even if there were any price cutting in town I would be sure that my own customers would prefer to pay the comparatively few cents difference and buy from me, rather than to go to the trouble of going to town, with chances for repeated trips to straighten out possible adjustments. But if I were carrying unknown accessories whose prices were higher than, or as high as, the standard stuff in town, I wouldn't blame my customers for buying the accessories they know were built right and fully guaranteed.

It may be presumptuous in me, with one month's experience as an owner, to write such a letter as this, but it seems to me that there are a great many dealer-garagemen who never "wonder what a new car owner thinks about," although the



new car owner is the man who is going to be a steady customer and a constant source of new trade as he sells his friends on his car and his garageman.

Oldsmobile Brougham Seats Five Passengers

Production has started on a new Oldsmobile body which will be mounted on the standard, four-cylinder chassis. The body is a brougham and will sell at $1425 f. o. b. Lansing. It is designed to seat five passengers, the entrance being to the front compartment and by means of a tilting front seat to the rear compartment. The price differential of only $280 between this new brougham and the open car puts it into a field where, from a price standpoint, it is within easy reach of the prospective open car buyer.

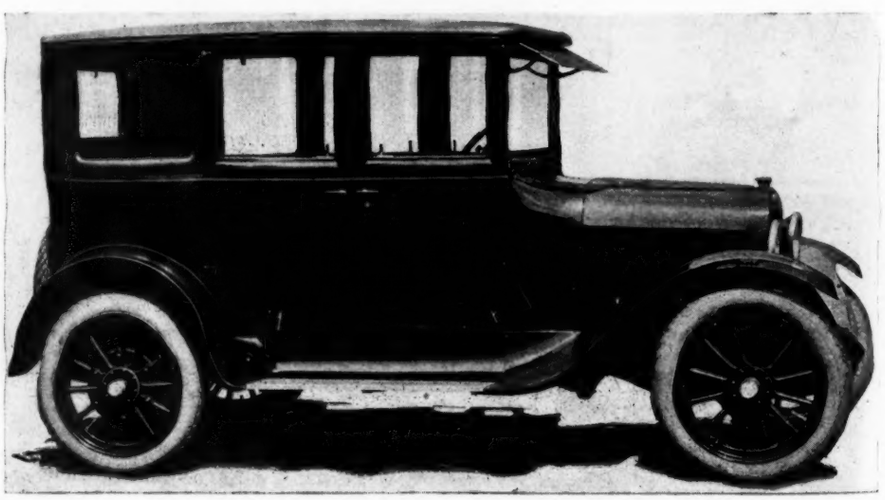
No comfort has been sacrificed in the design to make this an economical vehicle. Twenty-eight inches of leg room is provided from the front of the driver's seat to the end of the cowl and the steering wheel is 7½ in. above the seat, allowing 15¾ in. space between the wheel and the back of the front seat. The rear seats are 18¾ in. in depth and 31 in. has been allowed from the back of the rear seat to the back of the front seat, while the room of the body is 37 in. above the top of the rear cushion.

A feature of the design is the extremely wide windows and easy method of operation. An extra size square rear window has been adopted to provide clear vision for the driver. A metal sunshade is mounted on the windshield and under the rear deck a locked tool compartment has been provided. This new brougham includes all of the standard equipment.

Dodge Announces All Steel Business Sedan

A new all steel business sedan has been announced by Dodge Bros., Inc. It is similar in construction to the business coupe already described in MOTOR AGE. The sedan is so designed that in addition to meeting the requirements of a family car it may be used for light commercial hauling. An unusual construction feature makes it possible to remove the rear seat, seat frame, back and side curtains and even the foot rest in order to give clearance space. The front seat is made to tilt forward, giving a door opening large enough to admit a trunk or parcel 22 inches wide and 48 inches high.

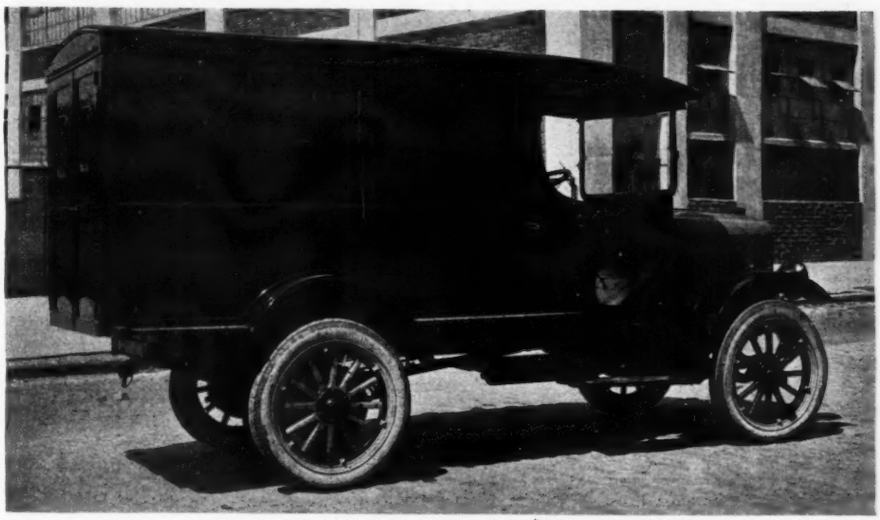
The steel body is finshed with baked-on enamel. The roof is fabric of non-rumble construction. The plate glass window in the rear is 16 by 28 inches, and there are large side windows. The list price of this car is $1195.



New Vim Truck Has High Maximum Speed

Accessibility a Feature of Design. Clutch and Gear Set in Unit With Engine

A NEW Vim truck, which bears no resemblance to the former model of that name, is now being produced by the Vim Motor Truck Co., of Philadelphia. The new model is a speed job and is conservatively rated at from 1,000 to 1,500 lbs. capacity. The chassis lists at $995. Fitted with open express body, the price is $1185 and with panel body, $1210. The maximum speed is 52 m. p. h.



Vim truck, with panel body, which is painted a dark olive green, with black trim and natural wood wheels. It sells for $1210. The maximum speed is 52 m.p.h.

The four-cylinder, L-head engine is a rugged, heavy duty design. The cylinder dimensions are 4 x 5 in., giving it a rated horsepower of 25.6. On the block, the engine shows an actual horsepower of almost 39 b. hp. at 1,600 r.p.m.

The crankshaft is balanced both statically and dynamically, and carried in three main bearings all 2 in. in diameter. The piston pins work in removable bronze bushings in the pistons. The pistons have three rings, two above the pin and one below. These rings are ¼ in. wide. The valves and valve operating parts are located on the right side of the engine and are entirely closed.

Oil is supplied to the main and connecting rod bearings under pressure. The oil pump is driven through spiral gears from the rear end of the camshaft. The pump is located at the extreme rear of the sump and at the lowest point. The pump is of the gear type and develops about 10 lbs. pressure at 1,000 r.p.m. of the engine.

Fuel is fed to the 1-in. Zenith carbureter by gravity from the tank under the seat. The intake and exhaust manifolds are cast integrally, a hot spot being provided to heat the mixture. Air entering the carbureter is preheated by passing through a stove on the exhaust pipe. Due to the fact that the carbureter and manifolds are on one side and the ignition system on the other side of the engine, the power plant has an unusually clean appearance and is very accessible.

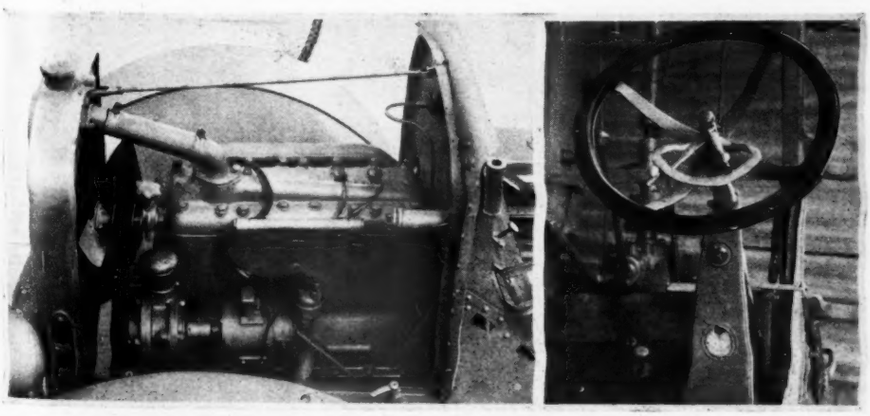
Cooling water is circulated by thermosiphon through a radiator of the tubular fin type. The radiator core is carried in a pressed steel shell which is spring supported on the frame. The outlet and inlet connections on both the radiator and engine are removable so it is not necessary to touch the hose clamps to break the connections at any of these points. The fan is driven from a pulley mounted on an extension of the shaft which drives the generator. The fan-shaft may be adjusted vertically to take up slack in the fan belt.

Electric starting, lighting and ignition are regular equipment. The starting motor and combined generator and ignition units are Westinghouse and the battery is a Willard.

The clutch and gearset are a unit with the engine. The clutch is a multiple dry disk type with five driving and five driven disks. A clutch brake is provided. The gearset provides three speeds forward and one reverse. The mainshaft in the gearset is mounted in ball bearings and the countershaft in plain bearings. A power take-off is provided for tire pump only.

The propeller shaft has two metal universal joints of the self-lubricating type. The rear axle is semi-floating and has a road clearance of 9½ in. Spiral bevel reduction gears are used, the ratio being 4.7 to 1. Torque and propulsion are taken through the springs. The sleeves surrounding the pressed steel axle housing and carrying the spring seats, extend far enough toward the center of the axle so that the rubber bumpers on the bottom of the frame side members strike them and not the axle housing. The differential ring and pinion are mounted as a unit so that the complete carrier may be removed from the housing without disturbing the adjustment. The pinion-shaft is supported by two roller bearings, both forward of the pinion.

The side members of the frame are pressed steel channels 5 in. deep with 1¾ in. flanges. The frame is braced laterally at five points. The springs are semi-elliptic front and rear. The front springs are 2 in. wide and 38 in. long, and have nine leaves with two rebound



Two close-ups of the Vim truck. Left, the engine compartment showing the clean design and layout of the units, which are very accessible. Right, the steering column support which has mounted upon it the ammeter and switch

plates. The rear springs are 2¼x50½ in. and have ten leaves with three rebound plates. The spring bolts are applied to the hangers by means of clamping bolts which eliminate the possibility of their working loose.

Both service and emergency brakes are located on the rear wheels. Springs are provided in the brake operating mechanism to take up wear in clevis and shafts and to eliminate rattles automatically. The turning radius of the truck is 19 ft. The wheelbase is 108 in. Wood wheels with 32 x 4 in. cord tires on Firestone rims are regular equipment.

The length from the back of the driver's seat to the end of the frame is 76½ in., and to the center of the rear axle 44¼ in. The maximum allowable body overhang is 10 in. and the maximum body width between rear wheels is 46¾ in. The driver's seat is 44½ in. wide. The extreme width of the frame is 30 in. and the distance from the ground to the top of frame, assuming the truck is fully loaded, is 27¼ in.

The open express body is ruggedly constructed. The uprights are made of ash and the steel sides are bolted to them. The tailgate is 12 in. high and is supported by covered chains. The seat is comfortably upholstered. The inside loading dimensions are length 85½ in., width at floor 44½ in. and height 55¼ in.

The panel body is intended for general merchandise delivery. The frame of this body is ash reinforced with steel. The wood floor is provided with metal skids. The rear doors have glass windows. The body is painted a dark olive green with black trim and natural wood wheels. The inside loading dimensions are the same as for the express body.

Novel Spring Suspension in Indiana Truck

Drive Taken Through Six Main Plates. No Shackles Used. Waukesha Engine in Power Plant

A NEW Indiana 1-ton speed truck has been under test for considerable time and is now about to be put in production. This new product of the Indiana Truck Corp. is mounted on a 132 in. wheelbase and will sell for $1425 f. o. b. Marion, Ind. The truck incorporates a Waukesha motor, 3¾ in. by 5¼ bore and stroke, with three bearing crankshaft. This engine is particularly designed for this class of service.

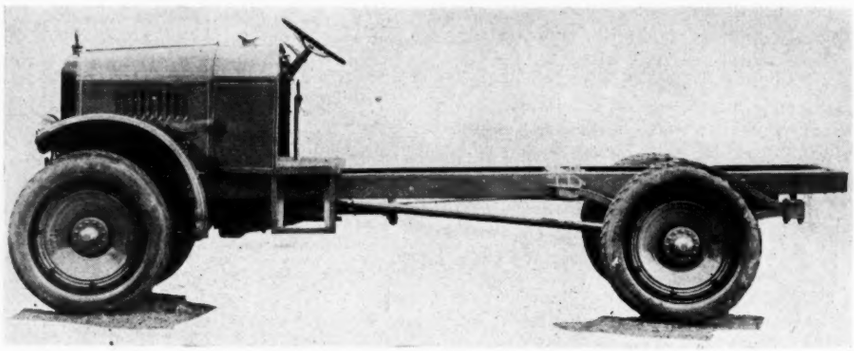
All the bearings except the piston pin are oiled by pressure feed system from the gear pump. The clutch is a dry plate type. The transmission gearset, a Brown-Lipe model 30, is mounted in unit with the engine. On high gear the truck has a ratio which permits of 30 to 35 m.p.h. The truck operates at 33 miles per hour at 2000 r.p.m. of the engine.

The factory claims that in actual tests, oil consumption average from 700 to 800 miles per gal. and gasoline consumption 13.4 miles to the gal. An acceleration of a 2 to 30 miles per hr. in 25 sec. with a total load of 7,000 lbs. is claimed.

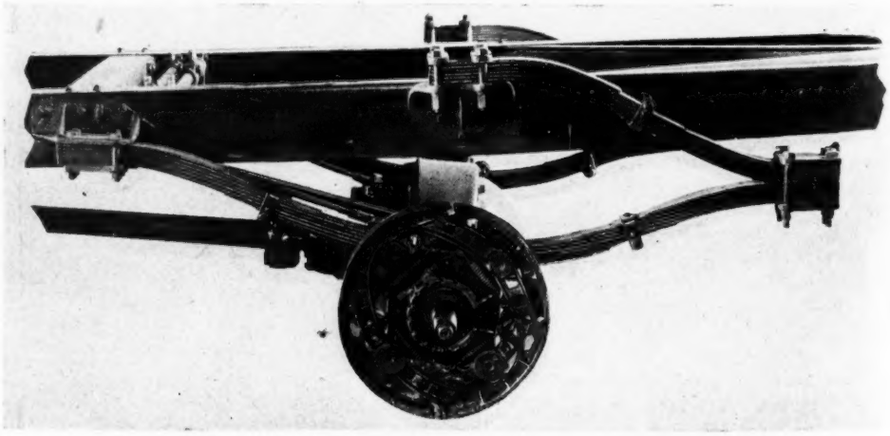
The rear axle is a semi-floating type with Timken roller bearings throughout, the same bearings being employed on the front axle. In the spring suspension, which is the Lacock design, three-fourths elliptic springs are employed for both front and rear. The principal feature is the arrangement of the leaves and the elimination of all shackles and ground bolts. No lubrication is necessary. The springs are 2½ in. wide, both front and rear. Silico manganese steel is employed for these springs and the rear springs take both the drive and torque reaction. The drive is taken through six main plates instead of one main plate as in Hotchkiss drive.

The wheels are disk steel equipped with Firestone steel fellow bands. The tires are 34 by 5 in. pneumatic cords, front and rear. The other equipment includes a Stromberg carbureter, Bosch generator and distributer, motometer and the usual lamp and horn equipment.

One of the new features in the construction of this truck is the pressed steel frame. The side members are 5 7/16 in. deep with a 3¼ flange. The distance back of the driver's seat to the rear end of the frame is 98 in. The distance back of the driver's seat to the center line of the rear axle is 59½ in. The width of the frame is 34 in.



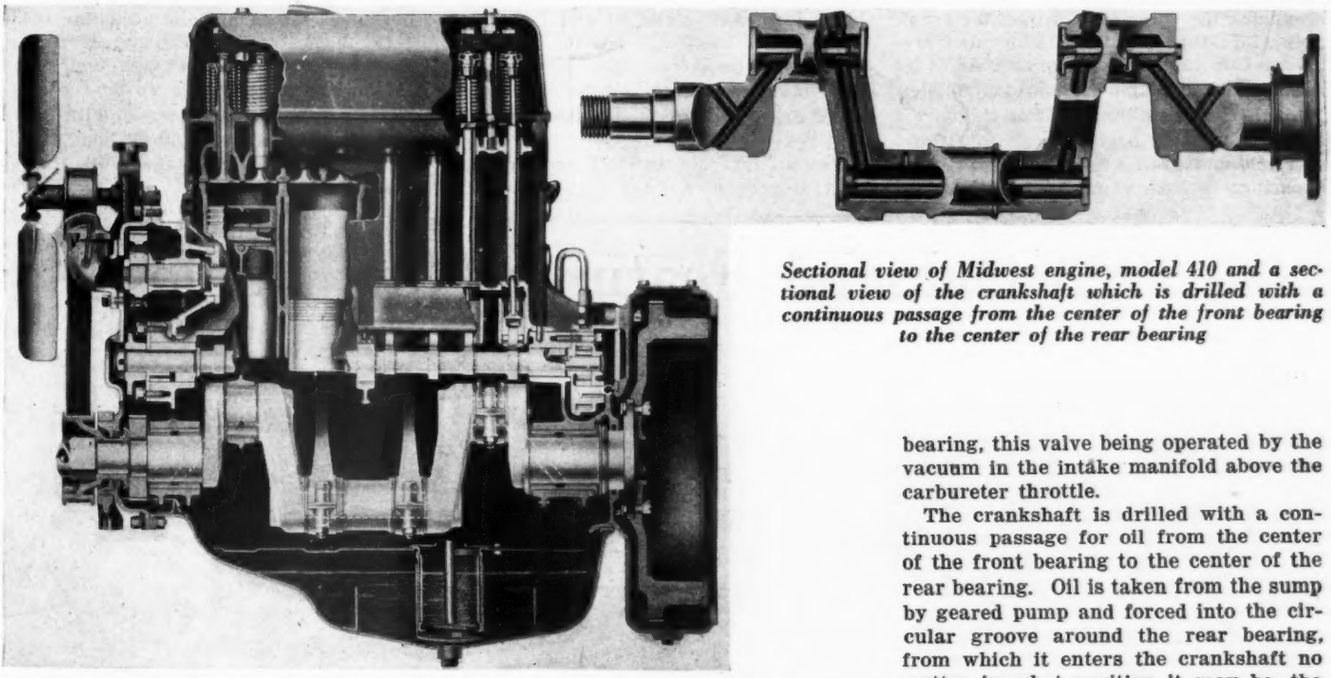
1—Side view of chassis in new Indiana 1-ton speed truck



2—Light box type of ¾ elliptic spring suspension used both front and rear on the new Indiana truck. Note the employment of Hotchkiss drive with this type of spring which eliminates all shackles and ground joints

New Midwest Passenger Car Engines Made With Floating Bearings

No Shims or Oil Grooves Provided. High Compression Engines. Large Volume of Cooling Water In Head and Cylinders



Sectional view of Midwest engine, model 410 and a sectional view of the crankshaft which is drilled with a continuous passage from the center of the front bearing to the center of the rear bearing

AMONG recent passenger car engine developments are three engines designed and manufactured by the Midwest Engine Corp. One—Model 411—is a 3⅝ by 5 in. engine with thermo-syphon circulation, Model 412—3⅝ by 5 in., with water pump, while the other is Model 410—3⅜ by 4½ in.

The bearings are exceptionally large, with neither shims nor oil grooves. All bearings are from .003 to .005 in. larger than the shaft and cam shaft, this clearance providing for an oil cushion. These particular engines have unusually high torque at low speeds and large horsepower at high speeds—the torque peaking at 1,000 r.p.m. in both models.

As the engine speeds run up to 3,000 r.p.m. on the 410, and 2,400 to 2,700 r.p.m. on the 411 and 412, it will be appreciated that lubrication plays an important part in the design. To meet the necessity of lubricating such large diameter bearings at such speeds, it was found necessary to "float" them and this is accomplished by making the bearings larger than the shafts, as above stated, and using no shims or oil grooves in the metal. In fact, the bearings are burnished so as to eliminate any edge or surface which could possibly scrape or break the oil film. The oil, then, is continually forced into all bearings in extreme volume and under high pressure when under load.

The engines are of the valve-in-head type. In both, the cold water is first conveyed direct to the exhaust valve seats through passages cored in the cylinder block and head, thus maintaining the lowet possible temperature at the valve seats and valves. The cooling provided allows an extremely large volume of water to circulate about the head and cylinders which keeps the temperature of the engine within such limits that high compression are used.

In the Models 411 and 412 the compression is 90 pounds and in the Model 410, 95 pounds—the latter engine being thermally cooled as above stated. As the fuel in use becomes heavier and more difficult to handle in the average engine, it has been Midwest practice to increase compression in order that the heat generated by the higher compression could be made use of in handling such heavier fuel to better advantages and, because of that, get a still greater economy in fuel consumption.

The lubricating system may be termed a constant delivery type. The oil is delivered to every bearing in the engine except to the wrist pin bearings, continuouously and under pressure, regulated in proportion to the load on, instead of speed of, the engine. This method provides lubrication when needed. The regulation is by means of a by-pass valve located over a groove around the front bearing, this valve being operated by the vacuum in the intake manifold above the carbureter throttle.

The crankshaft is drilled with a continuous passage for oil from the center of the front bearing to the center of the rear bearing. Oil is taken from the sump by geared pump and forced into the circular groove around the rear bearing, from which it enters the crankshaft no matter in what position it may be, the oil from that point passing through the shaft, in large volume and at high speed, to all bearings continuously.

The oil, on reaching the front bearing, is allowed to escape into the gear case cover from under the by-pass valve when the pressure is greater than 50 lbs., or when the vacuum is greater than the spring tension which normally holds the valve closed. The action of this regulating valve is as follows:

When full load is on the engine, the vacuum in the manifold and above the piston is approximately one pound; the spring above the piston on the regulating valve is then the stronger of the two factors, hence holds the valve down to such an extent that the pressure on the oil line must reach 50 lbs. before the valve will rise from its seat. The oil being forced into the shaft must therefore find its outlet through the loose bearings and as 1.7 gal. is pumped at 1,000 r.p.m. and 1.96 gal. at 1,200 r.p.m. and 50 lbs. pressure under full load it will be understood that each bearing will float even under maximum load and speed conditions. Under full load the vacuum being but one pound it is not sufficient to suck or pump oil into the cylinders past the rings, although the inside of the cylinders are drenched with oil, the amount of which under these conditions is excessively great.

When the load is thrown off by the

throttle being closed, the vacuum above the piston jumps to about 8 lbs. and if the same supply of oil was then being thrown into the cylinders as when running loaded, the rings could not possibly prevent the oil from pumping up into the firing chambers. Inasmuch as the bypass valve operates as the vacuum changes, the outlet from the front bearing is opened, thus allowing the oil to flow freely and under but a very low pressure, into the gear case cover, relieving the pressure on the system and reducing the volume thrown off the crank pins into the cylinders. This also prevents the waste of a large volume of oil in the firing chambers, carbon troubles, cleaning expense, and loss of time.

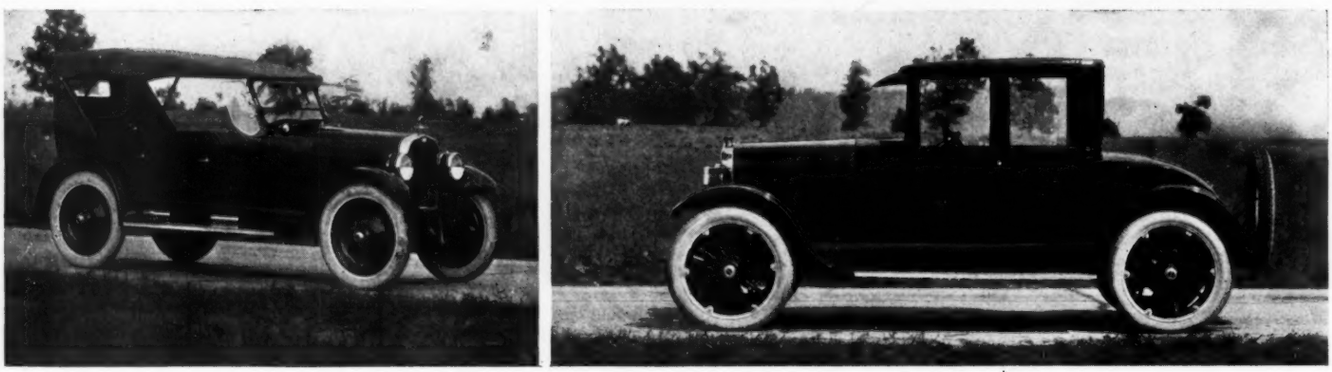
The camshaft bearings are lubricated by passage leading from the main bearbearings to each camshaft bearing. The piston pin bearings which are carried in the piston (the pins being locked in the roads), are lubricated by oil scraped off the cylinder walls next to the water jacket where the lubricant has a high lubricating body, instead of taking it from the inside of the piston head chamber where its value has been reduced because of the excessive heat found at that point.

The lower side of the bottom ring is used to scrape oil from the cylinder wall and from a point directly over the bearing a lead carries the oil under the ring direct to the top of the bearing, the point of highest pressure. The sides of the pistons are slightly relieved so that a large amount of oil is available for this purpose.

The engines are entirely enclosed and dust is prevented from entering except through the carbureter. An efficient air cleaner would complete the job. The breathing is done through the tubes enclosing the push rods, the oil vapor and spray being carried up into the valve chamber, thus lubricating all valve stems, rocker arms and contacts. The rocker arms are designed to "rock" at all points of contact instead of having journal type of bearings, hence as all parts are of hardened steel and ground, wear is practically eliminated.

All valve adjustments are made from overhead, a lock nut and adjusting screw being used, these being carried in a bar running across the head from end to end. By removing the valve cover the valve adjustments are easily made, with plenty of space to work in, and without danger of being burned by contact with the hot manifold.

1923 Oakland Features New Bodies



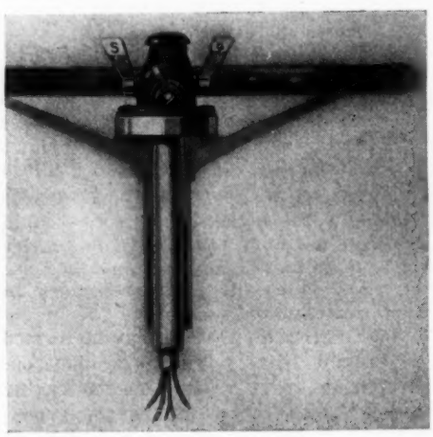
Oakland Four-passenger sport car and two-passenger coupe. The bodies have a deeper appearance caused by dropping the running board slightly and fitting heavier and deeper crowned fenders.

The 1923 series Oakland cars are featured by an entirely new line of bodies with deeper lines accentuated by heavier and more fully crowned fenders and by a running board which is 1½ in. lower than formerly. While the change in exterior appearance is striking the cars are not radically different from the previous model in mechanical detail. Probably the most important change is in the introduction of the new exhaust heated intake manifold in which the exhaust temperature is controlled by the throttle.

The damper is interconnected with the throttle in such a way that the heat is decreased as the throttle is opened thus giving the desired effect for easy starting without affecting the output of the engine at higher speeds by unduly expanding the mixture. The new Marvel carbureter has also been adopted and it is claimed that this also is a material factor in improving starting and general carburetion.

A number of detail refinements from the standpoint of comfort will be found throughout the entire car. There is now a lever on the steering column for dimming the headlights. Another innovation is the new hand control for the spark and throttle instead of the usual quadrant. The gearshaft lever has been lengthened and the steering wheel is considerably more dished to add to the convenience in reaching the controls.

The only other change of a mechanical nature of any importance is the adoption of the new type Remy distributor head in which the advance is taken care of inside of the breaker box instead of by moving the whole head as formerly. In the fittings, car now has drum lamps and nickle plated radiator and other parts. The rear windows and windshield are now of bevel glass and in the closed cars a heater, rear view mirrow, windshield wiper and snubbers are standard equipment.



A change has been made in the spark and throttle levers on the Oakland as shown in the above illustration. The steering wheel was dished considerable to accommodate the new levers

MOTOR VEHICLES AID FARM STUDIES AT MISSOURI UNIVERSITY

Motor vehicles are used for many agricultural purposes at the University of Missouri.

A runabout is used by field representatives of the Department of Entomology for nursery inspection. A delivery wagon and a runabout are employed by the Horticultural Department for handling orchard and garden products.

Three touring cars serve the College of Agriculture in making soil surveys. A heavy truck is used for demonstration trips in the agricultural extension work. A runabout is provided for the superintendent of the hog cholera serum plant. Several additional cars and trucks are used for general purposes.

Continental 6-Y Engine Especially Suited to Needs of Light Six

Engine Designed From Standpoint of Low Production Cost. Crankshaft Carried on Four Bearings. Cooling Water Surrouds Every Valve. Lubrication by Full Pressure System

Three cars in what is generally termed the $1,000 six class—Moon, Davis and Columbia—are using the Continental 6-Y engine, a brief description of which appeared in MOTOR AGE at the time of the Chicago show last February.

AS would be expected from the field for which this engine is designed, that is, a light weight, economical six-cylinder car, the engine is designed from the standpoint of production ability as well as performance from moderate dimensions. With a bore and stroke of 3⅛ by 4¼ in., giving 195.6 cu. in. piston displacement, the engine peaks at 2600 r.p.m., at which point it develops slightly in excess of 50 hp. with 20.5 per cent compression volume. The engine has a minimum of 115 ft. lb. and a maximum of 118 ft. lb. torque at 400 to 2200 r.p.m. Forty-five horsepower is developed at 2150 r.p.m., and in the experimental model, the speed range has been shown to be from 3 to over 60 miles per hr. on high gear.

The engine is an L-head type, with cylinders and crankcase cast in a unit. The cooling water surrounds each cylinder, valve seat and valve stem. The removable cylinder head is attached to the cylinder casting by twenty-one studs. Four lifting lugs are supplied to simplify the removal of the head and to prevent damage to the gasket.

The cast iron pistons are 3⅛ in. long. They are provided with three piston rings of one-piece, diagonally split type. They are hand fitted, first to the cylinder bore and then to the grooves of the piston. The piston pin is clamped in the connecting rod, the clamp bolt passing through the connecting rod just below the piston pin, which is grooved to fit the bolt.

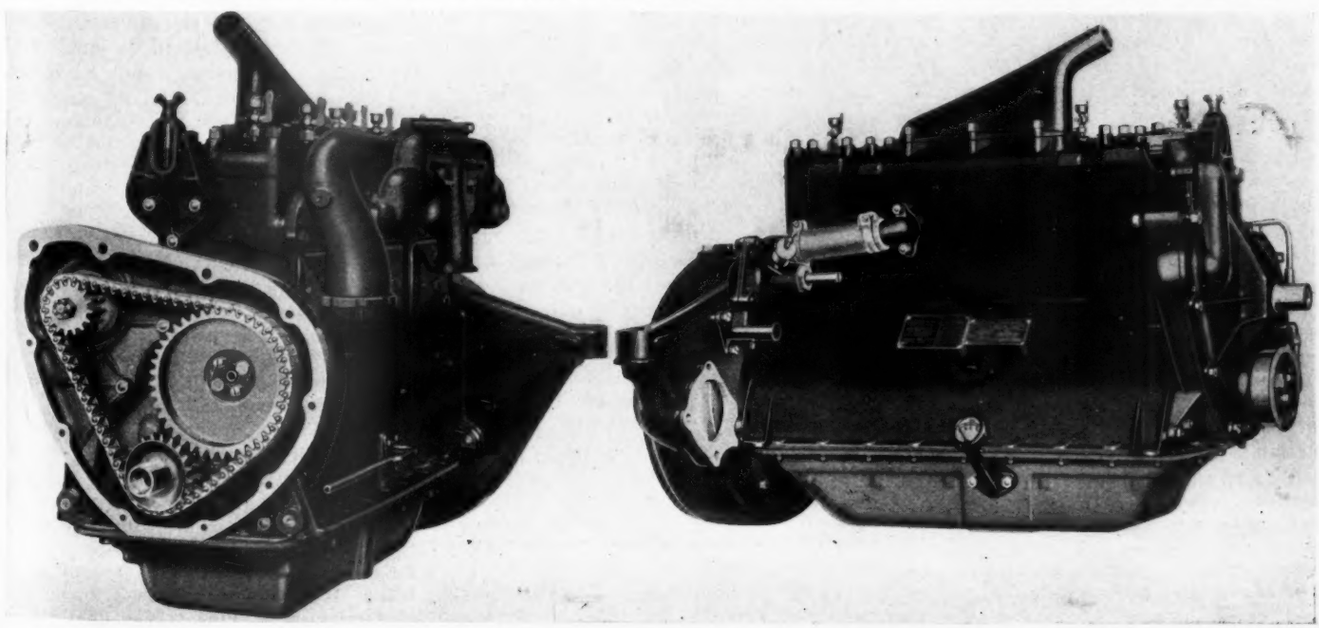
The piston pin is fitted in the piston before assembly and then the piston assembly is fitted to the connecting rod. The crankshaft is carried on four bearings, each of which is 2 in. in diameter. The lengths, from front to rear, are respectively 1 7/16, 1⅜, 1⅜, 2 11/32 in. The connecting rod crank end bearing is also 2 in. in diameter and 1⅜ in. in length.

The camshaft and generator are driven by a chain with an eccentric adjustment on the generator for a take-up. The valve mechanism is particularly simple, the push rods riding directly on the cams. The push rods are fitted with an adjusting screw and locking device in the usual manner and the valve guides are removable. The push rod guides are removable and are made in three groups of four each and arranged in such a manner that they form a sub-assembly which can be removed as a unit without taking off the block.

Lubrication is by pressure feed with a gear type oil pump located in the chain case. The oil is drawn through a copper tube leading from the oil reservoir to the pump, from which it is forced to the main distributing line with branches to each main bearing. The oil enters the drilled crankshaft at these points and is distributed under pressure to the connecting rod bearings. Other points are lubricated by the oil which is thrown from the connecting rod lower end bearing. As an added protection to each of the four camshaft bearings, a catch basin is provided from which oil flows through drilled ducts.

Cooling is by centrifugal water pump bolted to the flywheel housing and driven by an extension shaft from the electric generator. The fuel system is arranged to provide an adequate amount of heat to assist in the vaporization of present-day gasoline. The intake and exhaust manifolds are separate castings, but arranged so that the heat of the exhaust is utilized to assist in vaporization.

The engine is designed to be installed with a three-point suspension. The third point of support is 1½ in. in diameter by 1⅝ in. long and is integral with the chain case cover. The rear supporting arms are cast integrally with the flywheel housing. This housing is a separate unit which bolts to the crankcase. Teeth are cut directly into the rim of the semi-steel flywheel to accommodate the starting motor. The weight of this engine, without accessories, is 470 lb.



Continental 6-Y engine showing, at the left, the triangular timing chain, at the right, the large grease cup on the water pump

Selling the Idea of Tractors for Belt Work

Some Ways in Which This Prime Mover Will Solve the Problems of Timely and Efficient Belt Work on the Farm

By E. A. WHITE

IN presenting the advantages of tractor uses to the farmer, it is necessary to include a picture of the possibilities of this prime mover for improving the efficiency of belt operations if the sales story is to be complete. In the past especial emphasis has been put upon the advantages of the tractor for draw bar work, especially plowing, which is entirely proper as far as it goes, but it is only half the story. Belt work is just as essential to the successful operation of the farm as draw bar work and the tractor offers possibilities in this field which not only increase the general efficiency of farm operation but also reduce operating expenses.

The belt work on the farm has been largely done by custom operators, men who controlled the outfits and went from farm to farm threshing, filling silos, shelling corn, baling hay and sawing wood, for stated prices. Frequently this work was not done at such times as suited the farmers' requirements but when the custom operator could get there. As the custom operator wanted to make money he usually had a large outfit requiring a large crew for operation and long drives in exchanging help. On account of the rush to get the work done under this system the quality of work has not always been of the best.

The tractor dealer is faced with the proposition of selling the farmer a new system of doing belt work made possible by the introduction of this prime mover adapted to both belt and draw bar work. It is perfectly logical that if a farmer has the power in form of a tractor that he should own and operate the machines necessary for his belt operations or if his farm is not large enough to furnish the labor necessary for the belt work he can form a cooperative enterprise with a number of neighbors where the machines required for belt work are owned jointly.

There are some belt operations such as grinding feed where there is sufficient labor even on a small farm to do the work but in most cases it is necessary for a number of farms to combine forces for threshing, silo filling or shelling corn and the number of farms required depends almost entirely upon the labor situation. There are cases where a farm will have sufficient labor for a belt machinery crew. Here it is advantageous for the farm to be equipped with the belt machines necessary for its work but in other cases it is desirable to promote the cooperative ownership or use.

This can be done in either one of two ways, depending upon the conditions found. Frequently there is a farmer, who has been a custom operator, who is willing to purchase a tractor and the belt machines making an agreement with a number of neighbors to do their work at the prices current in the neighborhood with the understanding that the work for this group is to be done before additional work is taken. This has proved to be a satisfactory arrangement when the right man can be found.

Belt Work Constitutes 23 Per Cent of Power Used on the Farm

"The U. S. Department of Agriculture reports that in the winter wheat section the power for belt work constitutes 23 per cent of the total power used on these farms.

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"The tractor dealer is faced with the proposition of selling the farmer a new system of doing belt work, made possible by the introduction of this prime mover adapted to both belt and draw bar work."

In other cases a group of farmers is found which is interested in the proposition. One of them purchases the tractor with the understanding that he is to furnish the tractor and tractor operator for a given price, usually one-third or one-half of the net income, the different farmers furnishing the fuel, and the belt machines are owned cooperatively each man paying for an equal part. Current prices are charged each farmer in the ring for the belt work and the profits after deducting all expenses divided equally among the members of the ring.

The important point is for the dealer to present to the prospect the advantages which the use of the tractor offers for belt work and show him how these results can be attained. In this connection it is an excellent idea to investigate in detail the methods of the successful cooperative rings which are already in operation.

The power requirements for belt work vary according to the types of farming. In the small grain regions it is chiefly threshing. The U. S. Department of Agriculture reports that in the winter wheat section the power for belt work constitutes 23 per cent of the total power used on these farms and that threshing constituted 80 per cent of the belt work done. In the corn belt where livestock is kept it is threshing and corn shelling with the percentage of belt to total work approximately the same as in the winter wheat belt.

In livestock farming the percentage of belt work is larger for in addition to threshing there is silo filling, shredding and grinding. In some sections there is a large amount of hay baling. Fruit raising is practically the only important type of farming which does not require a large amount of belt work.

Now what are the sales arguments in regard to the possibilities for the use of belt machines which will be of value to the dealer in promoting the sale of tractors? In the first place there are critical times for doing belt work, times when this work must be done if maximum results are to be obtained both from the standpoints of the quality and quantity of the crop and getting this work out of the way of other farm work. Take threshing for example, it is essential to start this work just as soon as the grain is ready. Not only is there danger of loss due to bad weather by letting the grain wait but practically all important farm work must wait until the threshing is finished.

In filling the silo the same condition exists. There is a loss in the quality of the silage if the corn is not harvested at just the proper stage of maturity. When depending upon the custom operator the farmer may or may not be able to start belt work at the critical time but when he has control of the outfit there is no question about it. The work can be done at the right time. This is a big selling point for every farmer realizes the importance of timeliness with these operations.

It is equally important to get this belt work out of the way of other farm work for if time is lost waiting for a machine the prospects for future crops are impaired. Winter wheat is often sown on ground which has been in small grain. For the best results with this crop the ground should be plowed as early as possible. In regions where silos are filled it often happens that the threshing is not finished before it is time to fill silos when dependence is placed upon the custom outfits. This leaves no time to

prepare the ground and sow the wheat until far too late for these operations.

This point was well illustrated by the experiences of an Indiana farmer who had been an old custom operator. When threshing with the big outfit he always had difficulty in getting his wheat in before silo filling. After purchasing a small thresher in cooperation with five of his neighbors he found that he had two weeks for this work with the result that a good stand of wheat was assured.

The use of the tractor for belt work insures the more efficient use of labor. In the first place the crews are smaller. This does away with the long drives in changing help and permits a more efficient organization. Farmers are not generally efficient in organizing and operating large crews if for no other reason than their lack of experience in this field. If there is a breakdown requiring some time for repairs the crew can be dispersed to other work on the various farms with a minimum loss of working time.

Then the length of the working day can be controlled. In sections where livestock is kept the farmer wants time for doing the chores without being compelled to work late into the night. In the cooperative ring this is under the direct control of the farmers. In addition to all these advantages it has been found that in many cases the actual man-hours required for belt work have been reduced from ten to twenty per cent which is a direct saving in the cost of one of the most important items.

It is possible to show the farmer how the use of the tractor in this way offers an opportunity to improve the quality of his belt work. There are custom operators who do as good work as is humanly possible but it can be pointed out that when the farmer has direct control of these machines quality of work which is of especial importance can always be kept paramount. On this point, Frank I. Mann, an Illinois farmer with more than local reputation, once said; "The small thresher which I own has paid for itself in any one of three ways during the past three years. It has reduced the labor bill, enabled us to thresh when the grain was ready, and saved the grain which used to go in the straw stack."

In addition to these advantages tractor farmers have been able to realize reasonable returns upon the investment in belt machines by selling power, where the project is properly handled. It is not at all uncommon to realize an unusual return of from ten to fifteen per cent on the original investment where current prices are charged for the work. While, as a rule, this return will not any more than cover the interest and depreciation charges it is sufficient to make the other advantages clear profit.

There is a certain amount of educational work necessary in order to insure the successful mechanical operation of this equipment and the dealer may well consider this educational work as part of his selling service. The amount of this work to be done will depend upon whether the dealer is selling the farmer only the tractor or both the tractor and belt machines.

If selling only the tractor the dealers responsibility may reasonably be expected to end when he has his customer properly informed regarding the sizes of the various belt machines for which the tractor is adapted and makes it understood that to do satisfactory work the pulleys must be of the proper sizes to give the correct operating speeds.

If the belt machines are also sold it is important, in addition to the above information, that the customer be given a short but complete course on the proper methods of operation. This can best be done when the machine is started to be followed up when necessary by one or two additional visits on the port of the service man. These instructions should include the proper method of setting, adjustments to meet different conditions, lubrication, care of belts and an injunction to study the book of directions.

From the dealer's standpoint, there is much to be gained by presenting the possibilities of belt work in connection with tractor sales. It is necessary in order to make the sales story complete. It shows the farmer how he can get the most possible out of power farming and will be of material assistance in opening the way for future sales. Let the prospect know what the tractor will do for him in belt work.

New Atlas Speed Truck Supplied in Two Models

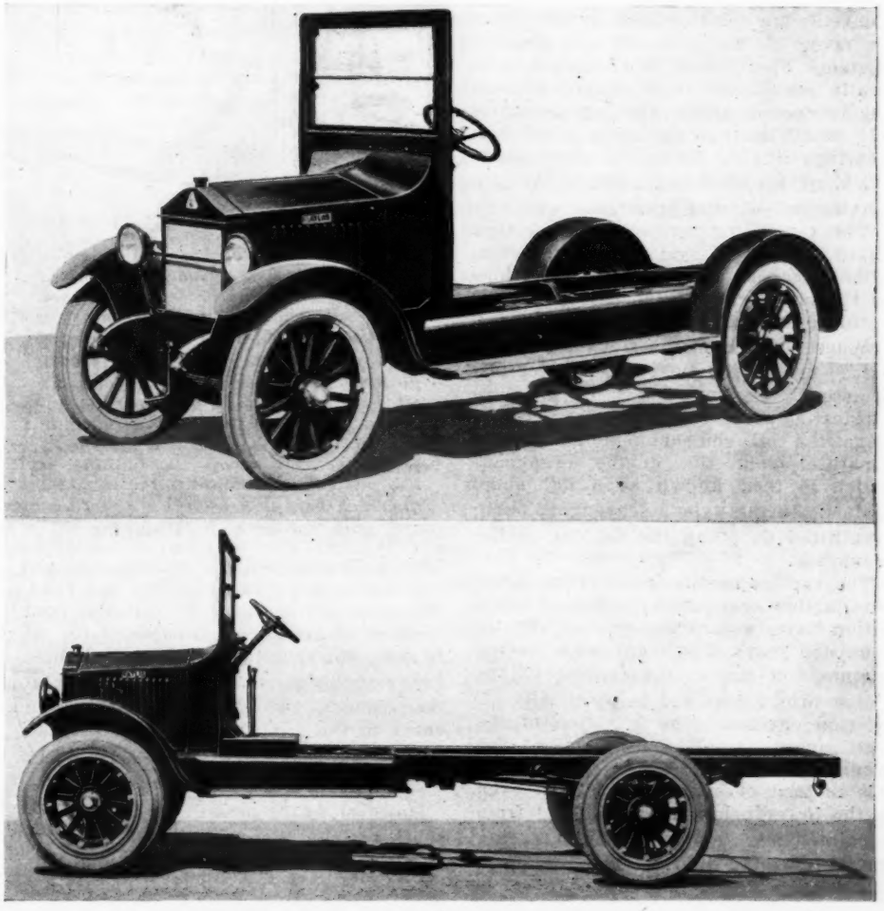
The Industrial Motors Corp. merged the Atlas Truck Corp., York, Pa., and the Selden Truck Corp., Rochester, N. Y. The Atlas speed trucks manufactured by the former are now distributed by the Selden Truck Corp.

The Atlas line consists of two speed models, the "Merchants' Dispatch," model 22, rated at 1 ton, and model 44, rated 1½-2 tons. Both models are equipped with the Buda "M" engine, 3¾ by 5⅛ in., and worm drive rear axles. The transmission is of Atlas design and manufacture.

The major specifications of the two models are as follows:

	Model 22	Model 44
Wheelbase	130 in.	146 in.
Wheels	Wood	Wood
Tires (pneumatic)	34 by 4½	36 by 6
Engine	Buda, mod. 44	Buda, mod. 44
Gearset	Atlas	Atlas
Springs	Semi-elliptic	Semi-elliptic
Steering gear	Worm & gear	Worm & gear
Chassis weight	2850 lbs.	3600 lbs.
Normal engine speed	1500 r.p.m.	1500 r.p.m.
Body weight allowance	750 lbs.	900 lbs.

The equipment of each truck consists of two headlamps, tail lamp, set of tools, jack, electric horn, Alemite gun and tire carrier. The body length available behind the driver's seat on the small and large models is 8 and 11 ft., respectively.



Pressure Lubrication Characteristics

Hollow Crankshaft System Will Not Function Unless Properly Maintained. Importance of Clean Oil, Sufficient Strainer Capacity, and Proper Bearing Clearance. The Basic Maintenance Idea of Circulrity

By PAUL DUMAS

REFERENCE to the engine design trend tendency curves discloses a substantial gain for the six-cylinder type of engine. Constituting 45 per cent of the number of models produced in 1916, the curve has moved upward to 59.1 per cent for 1922. Coincident with the gain in the six-cylinder type engine there has also occurred a similar gain in the type of engine lubrication known as the pressure hollow crankshaft system. The progress of the curve in this instance shows adherents to pressure oiling comprised 22 per cent of the models in 1916 with an almost constant upward tendency to 47.4 per cent for 1922. The rise of the six-cylinder curve can be traced to the increasing number of light, high speed, popular priced, small sixes now in production.

The light six, in order to compare in performance to the larger sized engines, has been built for higher normal crankshaft speeds than previously used for stock engines of this number of cylinders. Lubrication being an important item in maintaining high crankshaft speeds, the designers abandoned the conventional splash system in most cases in favor of the hollow shaft pressure system. Forced feed lubrication is generally considered as a system wherein oil is forced under varying pressures (10 to 80 lbs.) to the main crankshaft bearings whence by drilled passages in the shaft, the oil is conducted to the connecting rod big end bearings.

This is the simplest form of the hollow shaft forced feed system of lubrication, although there are many modifications in the circuit of the lubricant with the various manufacturers.

Where all engine bearings are lubricated under pressure, the system is sometimes known as a "full pressure lubricating system" and in some installations the oil compartment is entirely separate from the engine crankcase which is then known as a dry sump system. In this type a scavenging pump is utilized to pump the oil out of the crankcase.

The various modifications of the pressure, hollow crankshaft, method of lubrication have been in use successfully for about ten years, chiefly applied to racing engines, but also to the engines on the higher priced cars and to practically all aviation engines. The inception of the high speed, small bore engine has brought about a widespread adoption of this method of engine lubrication even in the lower priced cars. Viewed from a maintenance standpoint, the increasing use of pressure lubrication presents a few points which are perhaps worthy of the consideration of the up-to-date service and maintenance personnel.

The high velocity or pressure of the lubricant insures that the oil will reach every part of every bearing as long as the passages are not obstructed and as long as the pump continues to supply the oil at pressure. The presence of any foreign matter, such as dust or metal cuttings, is highly detrimental to the continued operation of the engine using this system of lubrication. Although dust and any form of sediment abrasives are injurious in a splash system, there is much less danger from particles that

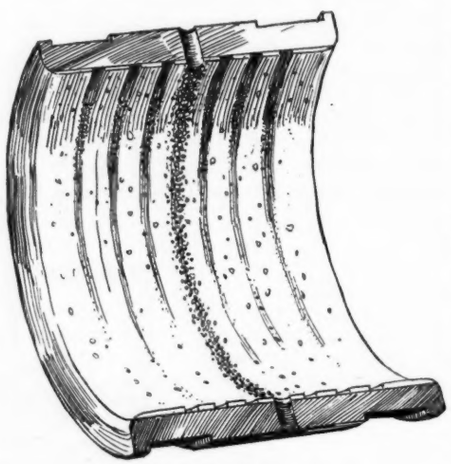


Fig. 1

Connecting rod bushing of aviation engine which has become impregnated with metallic sediment from the lubricating oil. Each individual speck on this particular bushing is a particle of aluminum or steel chips. The center portion of the bearing, in line with the oil hole of the half bushing, has received the greatest amount of metallic deposit. It can be seen that the specks extend entirely across the bushing at this point due no doubt to the fact that the crankshaft oil hole is in a direct line with the oil hole in bushing

have a decidedly higher gravity than the oil such as metal cuttings, clay and sand. The comparative lack of agitation and absence of pressure or motion of the oil in the splash system tends to allow heavy sediment to remain motionless at the bottom of the oil receptacle or at the entry to the pump screen where it can do little or no harm.

Pressure Conveys Sediment

However, in the pressure hollow crankshaft system, the presence of any foreign material, regardless of its comparative weight, is a potential and practical source of trouble. The very force that tends to provide positive lubrication for each bearing will tend to force all foreign particles in the oil to the same bearings.

The effect can be likened to water in a river bed of practically no gradient and water under pressure in a pipe. The water under pressure has the ability to carry with it sediment that in the case of the river would sink and remain at the bottom. The result of dirt in the bearings, that is between journal and bushing, is either a prematurely scored crankshaft or a bushing with roughened or friction producing surface. Where journals are unusually hard, the bushing suffers first, as the hard crankpin will pound the dirt or metallic sediment into the surface pores of the bearing metal. Eventually the shaft may become scored from the abrasive action of the impregnated bushing.

A shaft that is not heat treated at the journals will suffer from the effects of sediment considerably sooner than will the hardened shaft, in both cases the eventual result is the same. That this condition really exists can be attested by any firm doing large scale crankshaft regrinding. Several concerns report that hollow crankshafts require regrinding to remove scores and ridges long before the journal has become out of round. The appearance of bearings bushings which have been semi-impregnated with sediment is shown in the illustrations, figures 1, 2 and 3.

Proper Storage and Strainage

It is advisable to exercise caution in the storage and dispensing of oil for engines of every type but particular caution should be practiced where the oil is used in an engine using forced feed lubrication. Often the oil filler is not provided with a strainer and where one is fitted the tendency of some service men is to remove it to enable more rapid filling of the oil compartment. This places dependence on the strainer on the intake side of the pump to prevent entrance of foreign particles.

The pump strainer is not always of a design that will adequately compensate for initially dirty oil. A screen that is of fine enough mesh to prevent entry of small particles of grit must be of large size to provide sufficient clear area and in every instance will require frequent cleaning in order to allow sufficient oil to pass.

A coarse mesh screen, though not requiring frequent cleaning, is of little

benefit in preventing the entry of undesirable sediment or dirt in the oil. Generally less trouble is experienced where the strainer is located on the pressure side of the pump, if only one screen is used, as it permits the use of a very fine mesh. Frequent draining of the oil compartment and frequent cleaning of the strainers in the oiling system will do much towards the prevention of scored crankshafts and roughened bearings.

Engine Bearing Clearance

Some few mechanics still labor under the hallucination that the bearings on any engine should and must be snugly fitted if pounding is to be avoided. Bearings that are snugly fitted to a crankshaft drilled for pressure oiling will either burn out or will produce effects similar to those produced by adulterated and sediment laden oil. Perhaps much of the misunderstanding regarding the fitting of pressure oiled bearings is due to a lack of knowledge of the exact functioning of the pressure system. Constant association and servicing of the splash system will make the operation of fitting bearings more or less mechanical with the consequence that when a bearing job is to be done on a crankshaft using pressure oiling the same methods and tolerances will be followed. **The pressure hollow crankshaft system of lubrication has no troughs for the connecting rods to dip into, and if this one fact is kept in mind bearing maintenance difficulties will be well on the way toward solution.**

Usually the operator overlooks the fact that there are no dips or scoops on the connecting rods and that there are no troughs into which the rod ends can dip. If no clearance is allowed for an oil film, the bearing will heat and perhaps burn out. This may sound strange considering the fact that the oil is being forced to the bearing under pressure. However, if the bearing is snugly fitted the lack of clearance between the journal and shaft will not allow oil to enter between rubbing surfaces and, there being no trough to provide splash, the bearing will suffer from lack of lubrication. Even if sufficient oil reaches the surfaces to prevent the actual burning out of the bearing, there is a probability that, due to the lack of clearance, very little or no oil will be thrown out of the bearing thus depriving the piston and pin of its share of lubricant.

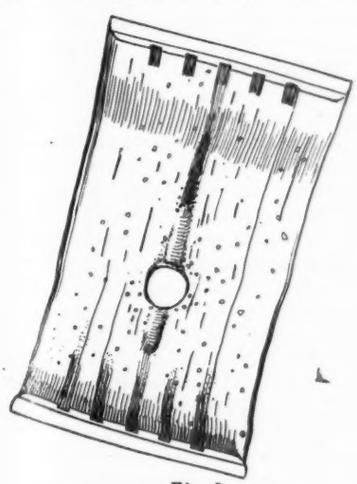


Fig. 2

Main bearing bushing half from the same engine. Less impregnation is present probably because of the strictly rotary motion of the crankshaft

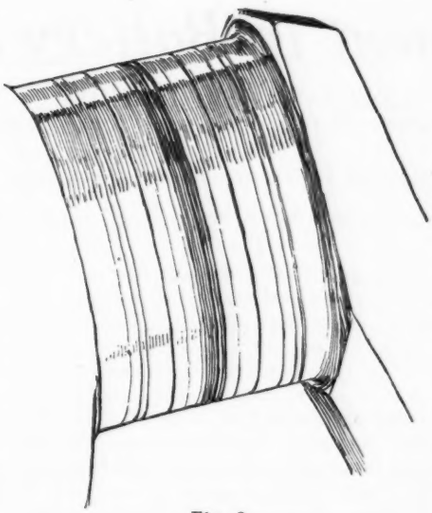


Fig. 3

Crankpin for the connecting rod, note well defined groove at center line where oil supply hole is located. This engine was in operation only 40 hours and was removed because it would not turn up to proper number of revolutions per minute. Elimination of friction by the installation of new bearings was all that was required to bring the engine performance to standard

Unfamiliarity of service men with the noise symptoms of engines often causes them to diagnose noises that are not connecting rod noises as of the connecting rod bearings. Their diagnosis, they feel, is strengthened in likelihood by the fact that the bearings are loose to the touch, overlooking the fact that this type of bearing must be fitted comparatively loose, especially if the engine be of the V-type with forked end connecting rods.

The plain or blade end rod usually has its bearing on the outside diameter of the inner bronze backed bushing of the forked or yoke end rod. The high expansion coefficient of bronze, coupled with the fact that the V-type engine crankshaft usually revolves at high speed, requires that the expansion be compensated for by allowing a cold clearance that on a vertical engine would be excessive. The inside bearing of the yoked end rod engine is not adjustable for wear and any filing that is done to the big end of the rod or the cap will destroy the circularity of the bronze backed bushing. The outside or blade rod then will have for its journal an eccentric shaped bushing a condition that is similar to fitting a bearing to a non-circular crankshaft.

These cautions may sound superfluous to the men familiar with maintenance operations on engines using pressure lubrication and forked end rods, nevertheless the writer has seen an otherwise well informed service man attempt to remove looseness from connecting rod bearings of a Cadillac engine by filing the inner rod and bushing. If the idea of circularity is firmly implanted in the mind of the operator when engaged in bearing work, the success of the job in hand is fairly certain. Beginning with the crankshaft journal, which should be as near a perfect circle as humanly possible, and ending with the inside and outside diameter of the bushing halves, the paramount thought should be to have both journal and bushing as two perfect circles one within the other.

In this respect it is worthy of mention that the manufacturer of a well and favorably known six cylinder car secures unusually long bearing life. The engine of this car is lubricated by the pressure method. The crankshaft is of large diameter and heat treated but the connecting rod bearings are not provided with shims. When it becomes necessary to remove the natural looseness due to wear, which occurs about every 15,000 to 20,000 miles, the crankshaft is micrometered and if circular a replacement rod is installed which has been previously reamed to a diameter, with clearance for an oil film and to compensate for expansion. Because both the journal and connecting rod bushing are circular, no hand scraping is done so that, after reaming, the rod is installed on the shaft and the job is complete.

The pressure oiling system requires no apology for its existence as it is featured on the best American and foreign products. However, the adoption of such construction in the stock car field is comparatively recent and the cars on which it is a part have not until recently been found in any great numbers in the isolated sections of the country.

The observations made here are intended only to acquaint the isolated service man with the characteristics of a type of engine construction that is gradually being incorporated in the popular priced cars, the cars which he is now, or very soon will be, called on to maintain.

AUTOMOBILES ARE SAVING THE RURAL SCHOOLS

Eighteen thousand rural schools are furnishing transportation for pupils to and from their homes. Through the motor bus the consolidated rural school is made possible and the number of consolidations is going forward at the rate of about 1,000 per year. There are still 180,000 one-room schools which should be consolidated.

Since a consolidated schools combines several adjacent school ditsricts into one school, it means a larger and better equipped schoolhouse. Since in the one-room rural school one teacher teaches all grades from the kindergarten to the eighth grade, while in the consolidated school each teacher instructs but two or three grades, this means fewer and more highly qualified teachers and better teaching.

Value of Equipment in Battery Service Stations

By GEORGE R. MURPHY
Manager Pacific District—The Electric Storage Battery Co.

(Reprinted From the Radiator, Oakland, Cal.)

I AM not certain, whether the title, as presented to me, is intended to involve the actual choice of suitable service station equipment, or simply set forth the value of up-to-date apparatus in building up a battery service station business.

Service, a much abused and misunderstood term, is today the keynote to the proper building of all business structure.

Service—except in the days of slavery—never meant something for nothing. In business it properly means giving the customer what he desires or needs in an efficient manner at the right price.

To fulfill this condition the service station must be able to handle its traffic rapidly and thoroughly and this can not be done by a mere wave of the hand. There must be present the tools, the testing apparatus and general equipment in order to obtain the desired efficiency.

The battery service station—I am eliminating any discussion of the electrical side—like Topsy has just "growed."

The development in the early years was so rapid, very little thought was concentrated on the necessity of proper equipment.

The lack of proper facilities today is reflected in some stations—in fact, we might say many. The business movement is slow and there seems to be a general atmosphere about the place of what I choose to term "waiting expectancy." It is even reflected in the attitude of the employees; indeed I am always puzzled as to whether they are performing a "hookworm shuffle" or a "drag anchor glide."

Advertising Value of Equipment

Up-to-date business men and manufacturers are spending thousands of dollars every year improving work rooms, exhibiting them to the public as an educational feature and merely for the purpose of proving to the buyer they know their business. The battery service station or any other business is no exception.

Modern equipment that a service station owner can show a prospect without an apology is one of the best forms of sales advertising; furthermore efficient methods and equipment, in addition to impressing the buyer, serve to stimulate the work of the employees.

Stimulation means speed, and speed means better service whether it be "free" or, which is preferable, "paid."

It is very difficult to outline an equipment suitable for all stations, because the choice and cost must necessarily be comparable and consistent with the volume of station business; therefore, it is only possible to attack the subject in a very general way and, as far as possible, in the order of the introduction of a customer into a service station.

Testing

In many cases—in fact, too many—it is the custom to accept the customer's word that a battery is in need of a recharge.

Very frequently, the customer having arrived, the movement is as follows:

The battery is (1) removed from the car, (2) rental battery is installed, (3) order written, (4) battery placed on the line. At the end of 24 hours (5) reported by charging man that battery refuses to take a charge, (6) customer is notified and permission obtained to open up, (7) estimate of repair made, (8) customer advised of cost, (9) haggles over the price, (10) order to proceed received, and (11) after a lapse of five to seven days transaction is completed.

This certainly registers waste of time and money of customer, increased expense to the service station, and irritation of the public, thereby affecting the service station business as a whole.

The number of "waiting to hear from customer" orders in the average station is pathetic, especially as every battery in the cemetery or morgue represents expense and deferred profits.

If, while the rental battery is being installed, the customer's battery was tested with a high rate discharge in the presence of the owner, and if a break down in insulation or any other trouble is apparent, permission could be obtained to open the battery, also in the presence of the owner, the sale discussed and completed on the spot, how much better is the profit when all the other foolish steps are eliminated?

There are, in general, two types of high rate discharge instruments. One, the small portable type, consisting of a fixed resistance attached to a pair of prods on which is mounted a low reading voltmeter. This type can only be used for testing individual cells of a battery, but is sufficiently good as an indicator. There are a number of makes on the market, some of which can be purchased for about $15.

The second type is more elaborate—both portable and stationary—and is capable of taking the high rate of discharge on the entire battery. The resistance on this type can be varied so that any desired rate may be obtained, and an ammeter in addition to the voltmeter makes it a very valuable piece of equipment.

In addition to testing work coming in, either type, but particularly the latter, is valuable as a check on work going out. Any repaired battery should be tested by discharging for a short period—long enough to obtain a voltage reading on each cell—at a rate of about 25 amperes per positive plate, equivalent for a 13-plate battery to a discharge of 150 amperes for a few minutes.

No modern station should be without one or both of these types. If they are lacking in any one station, then that station is in no position to intelligently explain the reason for taking an order for repair work.

Assuming a battery shows defective insulation or need of repair other than an ordinary recharge, the next step is the opening process.

For removing the connectors, a drill is, of course, necessary, and while a breast drill will easily do the work, the power drills are more rapid, therefore more economical.

Portable Drills and Drill Presses

The portable electric drill has a very wide range of use in a service station and for that reason is very popular. The number on the market is many, or it is very easy to make one, using an old starter motor. In general, however, the manufactured equipment is a better investment and has a better value.

The drill press is gradually being used more by service stations and those who have had experience with both types find this latter type of great advantage, especially in the elimination of broken covers and cracked jars, claiming this latter advantage more than offsets the advantage of flexibility in the portable type.

Steam and Electric Heaters

While there are many tools for cutting and removing sealing compound, they consist chiefly of putty knives, worn out chisels, old hack saw blades and kitchen knives, all working on cold compound.

The two modern recognized methods are the steam and electric openers.

The former consists of a miniature boiler for generating steam, which is piped to a header having three to six outlets with hose extensions. The steam is applied either to the inside of the cell through the vent hole, or directly to the compound on the outside, in either case keeping the battery covered with a damp cloth to prevent the steam from escaping too rapidly and lengthening the job.

The electric consists of a metal box, asbestos lined, having an electric heating coil or coils mounted in the bottom. By inverting this box over the battery and applying current, a battery may be opened in two to five minutes, depending on the heat applied.

Care must be taken to have the heating coil at a proper distance above the top of the covers to prevent the burning or charging of vent caps or jar edges—in fact, it is very advisable to cover all vent plugs with asbestos blocks.

As to the desirability of either type, it is an even break.

The steam boiler, if equipped with a still, will provide distilled water with little or no additional expense.

On the other hand, the steamer type leaves the top of the battery case and jars wet and in some cases makes it difficult to do a good permanent sealing job. Steam or heat introduced into the interior of a cell is sometimes objectionable, as it ruins completely some types of artificial separators.

The dry heat applied to the exterior by the electric is much to be desired as it thoroughly dries out the case and jar edges. Where possible the electric circuit should be so arranged by means of a double throw switch that two voltages can be applied to the heating coils, thus obtaining a high and low heat.

Where the electric is used, a still and burner are necessary to obtain distilled water.

The cost of either type is approximately $40.00. There are many designs of steamers on the market, but the electric at present can best be built and assembled at home.

Charging Equipment

The exact type of charging equipment to be selected depends somewhat on the source of power supply.

In general we have the following divisions—

(1) Power supply — direct current—rheostat control—batteries charged in series.

(2) Power supply—alternating current—rectifiers with rheostat control—batteries charged in series.

(4) Power supply—direct or alternating current—motor-generator set using constant voltage charging system—all batteries connected in multiple.

System (1) can be obtained only in the larger cities and, while it is one of the old accepted methods, the losses in rheostats are usually high and a number of circuits must be provided to care for batteries of different capacities. The only equipment necessary is a switchboard with indicating instruments and rheostats. The ingenuity of many people has been worked overtime in developing some of the crude efforts passing by the name of rheostat, and the difference in appearance alone between the product of a manufacturer and the budding inventor at home is sufficient to convince any sane individual that a purchase in the beginning is a far better investment and advertisement.

Methods (2) and (3) are simply mechanical and electrical means of obtaining direct current and from that point on the charging circuit is precisely the same in principle as (1).

As for method (4), it has been stated that constant voltage charging marks the most important advance made in battery service station operation for some time.

While this is true, it must be borne in mind that it is not a new system, as it has been applied for several years to the charging of large batteries of higher voltage than the automotive battery.

It was simply a question of designing a machine of the proper characteristics and voltage to make it applicable to the automotive battery.

The machines on the market to date consist of a motor, either direct or alternating current, direct connected to a double commutator, three wire, direct current generator.

The voltage across the middle and outside wires is approximately 7½ volts, and across the outside wires 15 volts. The batteries are connected across the circuit, the six cell batteries across the 15 volt circuit, and the three cell batteries across the 7½ volt circuit without any resistance in series.

When a discharged battery is placed across the proper circuit, the first rush of charging current is heavy, about 50 amperes for a 13 plate type. The rate decreases so that at the end of approximately six hours, the charging current has dropped to 3 or 4 amperes.

The advantages are self-evident. Current is put into the cell at a high rate at the time when it does the most good, and tapers off at the end when a low charging rate, low temperature and minimum gassing are advisable.

In addition to the good effect on the battery, this system completely charges a battery in six to eight hours instead of two to three days. This means the possibility of rendering quick service, a business asset.

There is, of course, the resultant saving to the owner in rental battery charges and the enormous saving in the number of rental batteries necessary as station equipment. The number of rentals may be safely cut in two.

There is a further saving of at least 25 per cent in power bills.

All batteries are connected to the circuit, irrespective of size, each automatically taking an amount of charging current proportionate to the size, whereas the other methods necessitate the segregation of the large and small types on separate circuits. The actual service station labor is less with this system.

The great point is that 8 hour service can be given by this system, whereas the other methods involve two days or more.

The machines, known to the writer, that are on the market at this time are the Chandeysson — Thomas Marshall, Sales Agent, Otis Building, Chicago, Ill., —Electric Products Co., Cleveland, Ohio, and Hobart Brothers Company, Troy, Ohio.

Cost may, of course, be a factor with many in selecting equipment.

At present rectifiers with a capacity of 10 batteries to 33 batteries may be purchased at from $100.00 to $185.00, while constant voltage charging sets vary from $500.00 to $600.00.

General

While the equipment outlined may appear expensive, there has been nothing mentioned that is not absolutely necessary.

Today most service stations are sadly in need of real equipment, and it has always been a question in the writer's mind whether there is a natural antagonism on the part of service station men to the elevation of their business to a higher plane, or whether it is merely ignorant self satisfaction because they did get by in the past. If the average carpenter was no better equipped than some service stations, he wouldn't be even considered as an applicant for a job.

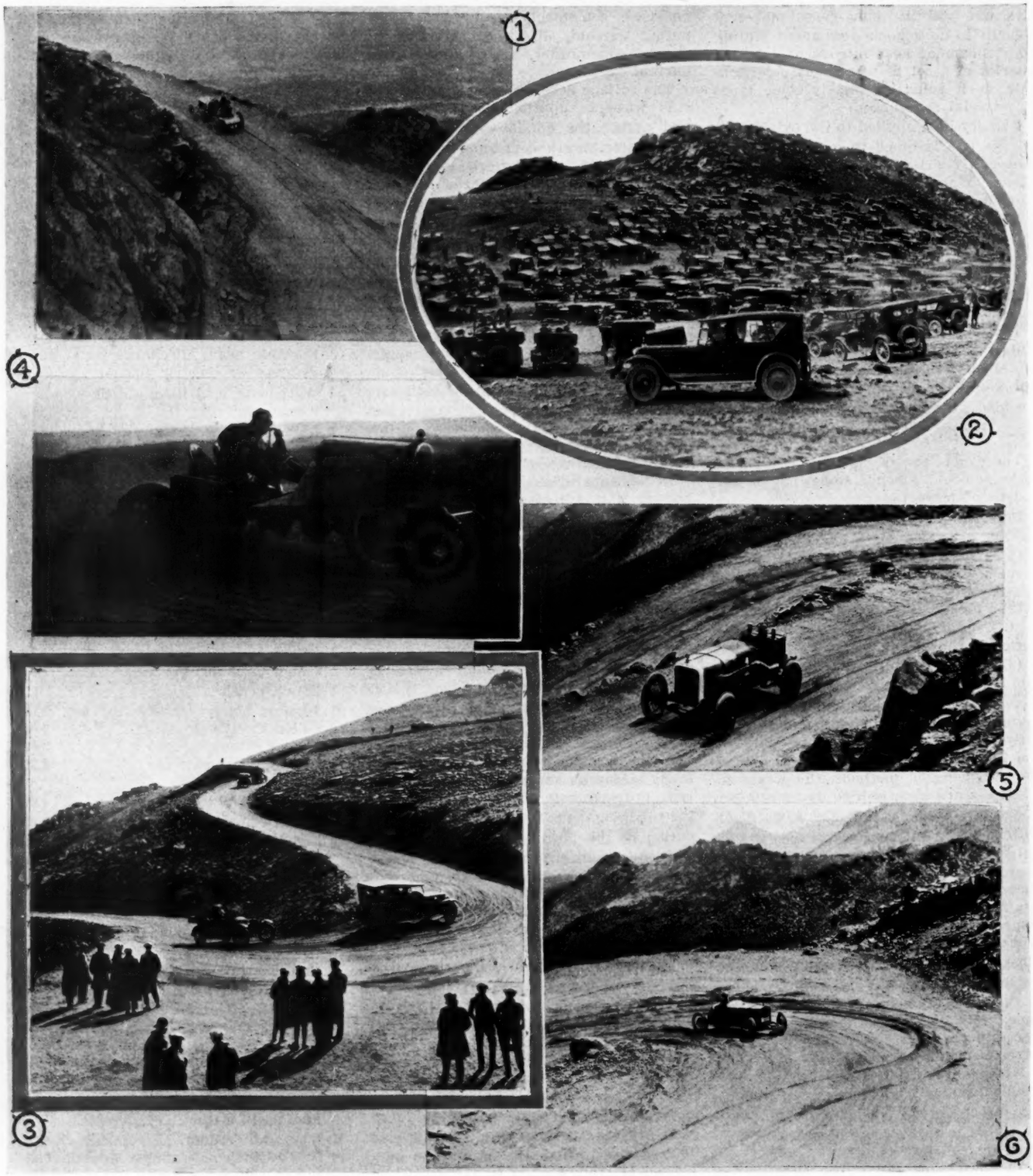
The hand tools necessary for any service station can hardly be set down, as this would depend to a very large extent on the size of the station.

For a small country station the following list of equipment, exclusive of charging equipment, may serve as a rough guide as to quantity and cost.

1	Brest drill	$5.00 to $10.00
1	Brace	4.00
1	Set straight shank drills by 32nd and ½-inch	5.00
1	Voltmeter	$15.00 to 45.00
1	Portable heavy discharge tester	18.00
1	Steamer or electric opener	40.00
1	Wash sink lead lined (home made)	15.00
1	Ammeter	15.00
1	Burning box (home made)	1.50
1	Jar testing outfit (home made)	2.00
1	Melting pot 6-inch	1.25
1	Ladle 2½-inch	.40
1	Small truck (home made)	1.50
50	Charging connectors	22.50
1	4-foot zig-zag rule	.50
1	Set steel letters ¼-inch	6.00
1	Set steel numbers ¼-inch	2.00
1	Pressure terminal	1.25
1	Pair tweezers	.25
1	Broom	1.50
1	3-inch paint brush	1.00
1	Bench brush	.75
1	3-gallon heavy bucket	2.00
2	6-inch C clamps	3.00
1	30-foot extension cord	3.00
1	Box joint end cutters	1.35
1	8-inch spatula	.65
2	8-inch gas pliers	3.00
2	8-inch combination pliers	1.65
2	5-inch combination pliers	1.40
2	8-inch grease cup pliers	.70
1	V-2-B hydrometer syringe	
1	V-2-B hydrometer only	
2	S hydrometer syringes	
1	S hydrometer only	
2	Paring knives	1.00
1	Putty knife	.35
1	Thermometer 0-150	
1	Separator trimmer	5.40
1	Connector reamer	.50
2	6-oz. syringes	
1	XC-9 sealing nut wrench	.30
1	SX-9 sealing nut wrench	.30
1	VC-7 sealing nut wrench	.30
1	Pos. post builder	
1	Neg. post builder	
20	ft. 5-16 inch soft rubber hose	6.80
2	Boney 550 wrenches	.66
2	Boney 502-A wrenches	1.06
½	doz. file cards	2.22
½	doz. files	2.10
½	doz. file handles	.30
1	Hack saw frame	$1.00 to 3.00
1	doz. hack saw blades, 12-inch med.	1.00
1	14-inch Stillson wrench	1.75
1	12-inch monkey wrench	2.50

Acid crocks about 25c per gallon.

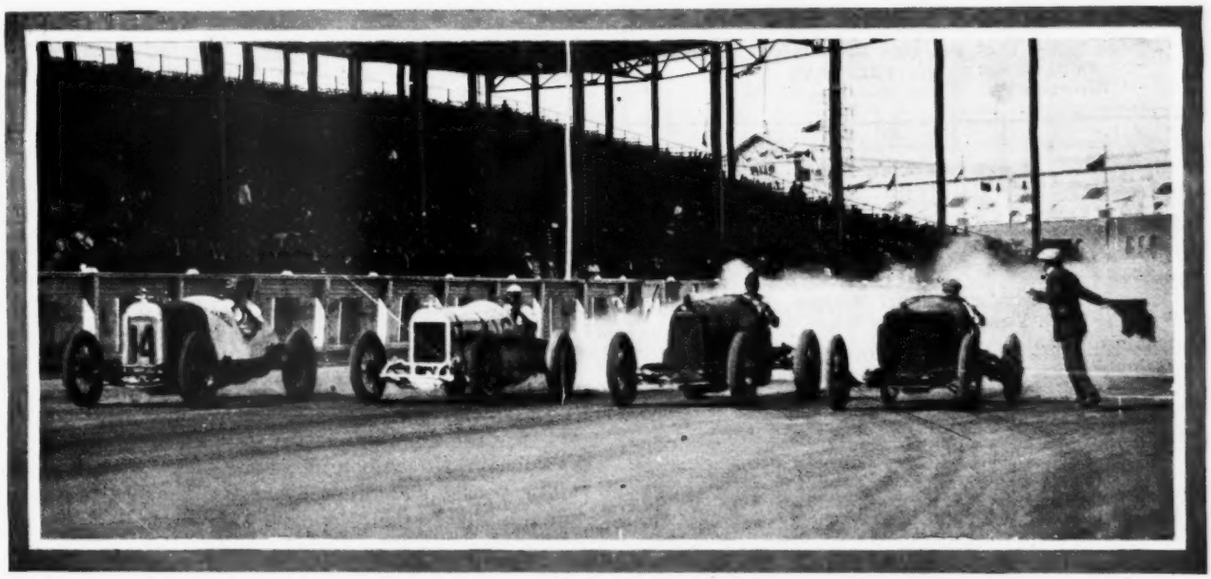
MOTOR AGE'S PICTURE PAGES



Pike's Peak Auto Highway, National Hill Climb Races
Some of the Racers in Action

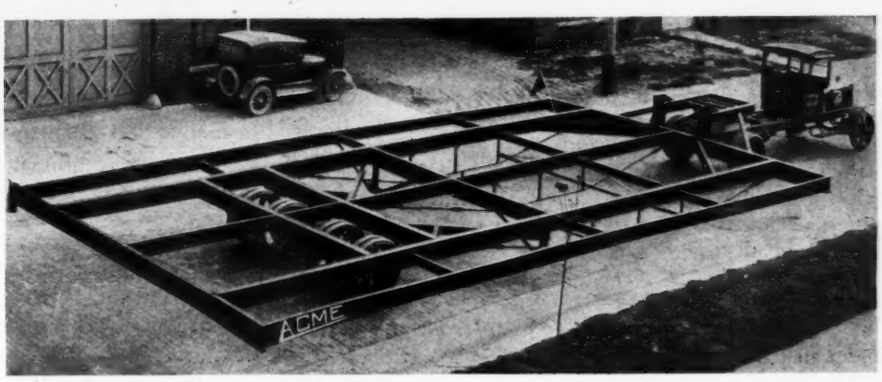
1. Hudson Special, King Rhiley, winner 1st place, Event No. 3. National Hill Climb Races on Pike's Peak Auto Highway, Colorado Springs, Colo. (2) One of the parking places at Pike's Peak Auto Highway, National Hill Climb Races, Sept. 4, 1922. (3) Just before the start of the National Hill Climb Races, near Mile 14. (4) Dodge Special, H. L. Chapin, 2nd place in Event No. 2, time 23 min. 25 4 5 sec. (5) Mercer Special, W. S. Haines, 3rd place, Event No. 3, time 20 min. 31 sec. (6) Essex Special, Glen Schultz, 2nd place, Event No. 1. Time 20 min. 41 sec.

OF AUTOMOTIVE INTEREST



The start of the heat winners in the Dominion Dirt track Championship races August 28th concluding event of the meet that opened Saturday, August 26 on the Canadian National Exhibition, Toronto, at which the attendance was between forty and fifty thousand. Lou Disbrow driving an Essex special was the victor

Owing to the death of a traffic policeman of Newport in a rainstorm, when his uniform could not be distinuished by a passing motorist, the traffic policemen of the exclusive resort now wear white tunics during rainy weather so that they can be easily distinguished in rain or fog



Over in Michigan the town of Jennings, consisting of 100 houses, had outlived its usefulness, while there was a housing shortage at Cadillac, 11 miles away. So the idea of moving Jennings to Cadillac was conceived. W. A. Kysor, president of the Acme Motor Truck Co., suggested that they be moved by truck. Kysor had a trailer built and the houses are being moved at the rate of about one a day.

MOTOR AGE

Reg. U. S. Pat. Off.
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An Orphan Car

THE question as to service on orphan cars is a quite important one, with interesting complications, one of which is the definition of an "orphan car."

In a broad sense, we will all agree that an orphan car is one left alone in the unappreciative automotive world by the death of the factory that created it. So far, so good. But there is another definition that is applicable to present conditions. Is not a car that has been sold in a community where the dealer has failed just as much of an orphan as the car orphaned by the death of the factory.

During the last two years, there have been many cars orphaned by the death of the dealer. This sort of mortality was especially heavy during the big selling period of 1920. During that period many distributors were able to sell all or nearly of the cars shipped to them at retail and they did not supply cars to the small dealer for so long a period that he forgot that he was a dealer and then in 1921 he declined to become a dealer again merely because there were a few surplus cars. These cars are being heard from now in great numbers and that fact that they are 100 miles, more or less, from an authorized dealer in this make of car, leaves them as orphans, so far as the owner is concerned.

From the point of view of maintenance, it would appear that a better definition of the orphan car would be, "one for which authorized service is not accessible." If this definition should be accepted, it would appear that factories should be more liberal in service provisions for these cars. Some of these cars are giving a black eye to certain factories because parts cannot be obtained for maintenance except under difficult terms of purchase and then at a very high price. The suggestion is obvious; that the factories make more liberal terms for the purchase of parts for their cars, specially in communities where they no longer have dealer connections.

The dealer whose maintenance department does not pay is not a competent critic of the independent shop that does make it pay.

The Legislative Department

THE legal or legislative department of the automotive industry needs to get busy in the very near future for the coming peak season of law making. At the elections in November members of the legislative bodies will be chosen and after the first of the year the men who gain the victories in November will gather in the various legislative chambers for the purpose of adding to the burdens of the citizen who respects the duly constituted authorities.

There are many unjust automotive laws now written on the statute books. The dealers of the country know very well indeed what these are. If a law is unjust it should be possible to convince the candidate that it is unjust and to pledge him to the repeal.

During the campaign is the most effective time to work for legislation. The candidate is then subject to approach without much formality. Once he is elected he is likely to be more exclusive and less reasonable in his attitude.

Dealers and maintenance men throughout the country should get together in their respective communities, work out a program for themselves, get into communication with their state association and get busy at once.

If you sell a truck or a bus to a man gaing into general transportation business, be sure he knows the cost of operation or he may not survive long enough to pay you.

Wash Your Own Car Fifty-Cents

ALL who make it their business to serve in some way the users of motor cars are acquainted with the car owner who wants to borrow a pair of pliers for just a minute. The same type of man borrows a pail for carrying water and leaves it wherever fancy dictates, always ready to ask favors, but rarely seeing the annoyance that it causes the other fellow.

Such familiarities are often indulged in by otherwise good customers, who may be prospects for the sale of a car or at least for equipment, so that even if the dealer felt like doing so he could hardly afford to take a chance of offending owners of this kind.

A problem of this nature reached an aggravated stage in a small town where good customers in other particulars, would drive into the garage as though quite at home, run their cars onto the wash rack, and proceed to use the garage's hose, water, sponges and other washing equipment in getting ready for the Sunday trip. Here the

imposition was especially felt on account of the high water rates, so that even on a regular washing job where real money was paid by the owner, the profit was considerbly reduced by the cost of the water used.

The solution reached by one garage was to put a large sign on the wall in the vicinity of the wash rack which read

WASH YOUR OWN CAR
FIFTY CENTS

It would be a hard boiled grafter indeed who knowing that there was a charge for the use of the washing equipment, would try to make use of it without paying.

Of course it is not true that "the customer is always right," but a large hotel company has found that it pays to admit that he is.

Dealers' Profits

THERE is a considerable agitation going on among dealers of the country for increased percentages for handling of cars. Dealers say that they cannot make an actual profit under the present terms allowed by the factories. Some dealers, accounted by rivals and friends as efficient dealers, assert that they are not making money. Some of them ever say that they are not making good wages.

There are, of course, two methods by which this situation may be remedied. One is for the factory to increase the discount percentage to the dealer; the other is to lessen the selling expense in the dealer's establishment.

Dealers answer by saying that they cannot lessen the expense and in the same breath they put much of the blame for the present profit situation on the used car. Some of the dealers come out openly asking for an optional trading allowance to be used in meeting the bidding going on around them for used cars.

The factory answer usually is that the used car is a dealer proposition and his remedy is to sell new cars and quit buying old ones at extravagant appraisals. The question will never be settled by the present discussion but there must come a time very soon, when this eternal argument will stop by an agreement between the factory and the dealer as to just whose problem the used car is and to what extent the factory can force more and more cars on the dealer.

It will be well for both dealers and manufacturers to go over their own plan of procedure very carefully, be sure that they are reasonably without fault and then talk in exact terms to each other in order to define the rights in the present no man's land.

In the meantime, it might be well for the dealer to experiment carefully in how much he can increase his volume in selling accessories, tires, maintenance and some other side lines. Usually such sales, when given a fair test, materially cut down overhead.

Keep your customers coming back to buy and not to complain.

What Does a Police Official Think Of?

A CHICAGO police official, after questioning two young men who had been arrested by motorcycle attaches of the station over which he presided, said: "The chief objection to the automobile on the part of the law-enforcers is not speeding—it is a greater evil that has sprung up within the last few years and is growing rapidly everywhere.

"There is strong legislation against it now, but it should be stronger, and this black smirch on the motor car is going to become something which the manufacturers and dealers will have a hard time combatting if they do not do it now. It is the practice of many young persons, like the two boys here tonight, indulging in drunken and disgraceful 'parties' at questionable road-houses.

"I have a car and I enjoy riding in it as much as any man and I certainly do not want to have that joy endangered by the type of people who are rapidly bringing about something that, if the 'black coats' could have their way, would prohibit automobiles being sold.

"I have heard more than one clergyman advocate a law which would make all automobiles enter their garages not later than midnight, and such a thing is not wanted. However, the 'flapper-flipper' affairs must stop. Young girls, not yet at the age of twenty, have been brought into my court here, so intoxicated that they actually could not tell me their right names.

"Let the decent car owners do all they can to stop this menace—people coming in here with charges of this nature will get all that I or my influence can get for them. If it was up to me to sentence them, I should handle them as a person charged with manslaughter is."

There's something to this—dealers can help, with benefit to themselves and others.

The season for the sale of summer goods is rapidly drawing to a close. You cannot afford to carry these goods over the winter.

The car that is well sold makes the dealer a customer; the one that is poorly sold is likely to make him an enemy.

Another Side of "Who's Afraid?"

A MEMBER of MOTOR AGE organization tells of an experience with a garage owner who is one of the kind that are making the garage business a pleasant and profitable thing. While driving through a nearby summer resort, this man had occasion to stop at this garage for water for his battery.

The garage owner complied with the request and when asked what the charges were, replied, "Nothing at all."

The MOTOR AGE man asked what this dealer would do if twenty cars were to come at once, all wanting water for the battery—wouldn't this take up at least two hours of the man's time? It would. And would he spend two hours without remuneration? He said he would do it gladly.

Whether this sort of treatment of the car owner pays or not is evidenced by the fact that the MOTOR AGE man returned to that same garage to have some repairs attended to, repairs that could have waited until he returned home. But who doesn't want to do business with the real business man, the one who is not afraid that it will break his heart and pocketbook if he says a pleasant word once in a while or does a little service for the customer?

Rural Sales Balance City Decline

August Output Approaches June Level; Demand Continues

Prospects Are That Farm Market Will Grow Steadily Stronger for Next Three Months

NEW YORK, Sept. 12—Midsummer is gone and it brought no seasonal slump in the sale of automobiles. The coming of September has been attended by no curtailment of output. August production was really sensational and closely approached the level of June which established a new high mark for the industry with 289,000. Specifications given parts makers for this month by passenger car manufacturers in all price classes are larger than they were for August.

With a record of more than 1,000,000 motor vehicles made in four months it is scarcely to be wondered at that the public is considerably mystified as to what has become of them. The simple fact is that they have been sold. No surplus stocks have been accumulated either in warehouses or on dealers' floors. Some slight allowance was made last month by manufacturers for the delays incident to the rail strike and freight congestion so that dealers would be able to have a few cars on hand but practically all of them had been sold by the time they were received.

It is possible, also, that the imminence of a severe freight car shortage has been accountable for some material orders placed for delivery this month, but by far the larger part of them are for use to meet current demand. Most manufacturers have made commitments running through October and November and a good many up to Jan. 1. There is not the slightest reason to think, however, that the industry is running wild and turning out products for which a market is not in sight.

Sales in rural districts have been larger than was expected and have practically counterbalanced any falling off in urban centers. Prospects are that the farm market will grow steadily stronger for the next three months. Farmers generally are finding themselves with more ready cash than they had counted on and many of them are using some of it to buy much needed motor vehicles.

Few price adjustments remain to be made this year and there will be no "price war." Competition is keen, but it is not likely to lead to foolish extremes. Balance sheets of car and parts makers show that they are prospering. Many companies which had suspended their dividends are resuming them and, with few exceptions, the year will show a substantial profit in the face of slowly mounting manufacturing costs.

New models have met with a cordial reception and several lines are finding it difficult to make deliveries. The closed car market continues excellent and it will be stimulated still further by the closed car shows which will begin soon.

The only cloud on the horizon for the industry at present is the freight jam which will not reach its peak for three or four weeks yet. There is no longer serious fear of being forced to curtail operations because of difficulty in obtaining coal.

Fritz Becomes Manager of Equipment Men's Association

CHICAGO, Sept. 11—George Fritz, formerly manager of the Research Club, an organization of automotive jobbers, has been appointed Business Manager of the Association of Automotive Equipment Manufacturers. This association has established headquarters in the Consumers' Bldg., 220 S. State st., here and will conduct an active campaign to extend its membership throughout the United States. It was organized about a year ago and its membership now includes about 80 manufacturers of automotive equipment in Chicago, St. Louis, Milwaukee and a number of other cities. Fritz stated that the association does not expect to hold a show this year.

W. E. Green, who has been secretary of the association since its organization, will continue in that capacity.

Dealers in Danger of Fine if Car Records Are Not Kept

SPRINGFIELD, Ill., Sept. 9—Illinois garage proprietors who have neglected to keep a record of all cars taken in for storage and repairs, as required by the Illinois Motor Vehicle act, are in danger of fine and costs. State investigators are now going from city to city and demanding to see such records. William Schlensker, 122 Walnut street, and Roger Calahan, 107 West Main street, both of Danville, Ill., were each required to pay fines of $100 and costs for failure to maintain such records. This state law was adopted by the last legislature, but has been thought to be a dead letter and many garages that originally started to keep this record, ceased doing so, owing to the difficulty in learning the engine number and the time consumed in acquiring the information. The maximum penalty is $500 and costs. The excuse for the law is its aid in tracing stolen cars. The minimum fine is being accepted for the first offense but the maximum is insisted upon for the second.

NORTH CAROLINA MOTOR CLUB

GREENSBORO, N. C., Sept. 8—Initial steps toward the organization of a North Carolina Motor Club were taken at a meeting here this week. Special committees to work in the interest of such an organization were appointed.

Ford Expected to Rescind Closing Order; Gets Coal

Contracts With Cincinnati Company For 4,000,000 Tons—Shipments to Be Rushed

DETROIT, Sept. 9—Announcement in Detroit today of an agreement entered into between the Ford Motor Co. and the American Export & Inland Coal Co., Cincinnati, by which the Ford company is assured of ample fuel for power purposes, makes it evident that if the contemplated closing of the plants is put through on Sept. 15, it will not be because of fuel shortage.

No intimation has been given by executives of the company as to the course of action now that fuel has been eliminated as a cause for closing. It is confidently expected in the city that Henry Ford will revoke the closing order, as the reason given for closing, inability to get coal at reasonable prices, has been removed.

There has been no statement made as to the price stipulated in the agreement, but from the buying head of one of the largest companies in the industry it has been learned that plenty of coal is now obtainable at $4.50 a ton, the price which Ford set as a reasonable figure. With the tremendous buying power of the Ford company and the amount of the tonnage involved in the agreement, about 4,000,000 tons, it is certain that the $4.50 figure was not exceeded.

Under the agreement the Ford company will begin the receipt of from 250 to 300 cars daily. Orders have been given by Ford executives to rush shipments forward as rapidly as cars can be loaded.

Ford production in August aggregated 136,000 in the plants located in the United States, and is reported the largest month the company has ever reached. Up to the closing date, the factory will be kept at as close to capacity as the fuel situation permits.

PLAN NATIONAL AVIATION ASSN.

DETROIT, Sept. 8—Definite plans for the formation of a national aeronautic association were announced here by Howard E. Coffin, of this city, who is chairman of the national advance committee on organization, in inviting 30 of the country's best known avaiation experts, pilots and enthusiasts to form the executive committee in charge of arrangements for the convention to be held in Detroit during the national airplane races, Oct. 12, 13 and 14.

"All that the American Automobile Association, with its half million members, has done for motor car transportation, for good roads and for legislation, this new national body here proposed must do for aviation, and more," said Coffin.

War Begun on Short Gasoline Measure

$14,831,179 Business in 1921 by California Motor Lines

Busses and Trucks Carried 13,002,043 Passengers and 398,328 Tons of Freight

SAN FRANCISCO, Cal., Sept. 12—Records just compiled by the California State Railroad Commission show very high and consistent profits from the operation of motor transportation lines throughout the state. The automobile stage and motor truck lines of California, 800 in number, received a gross revenue of $14,831,179 during 1921, and carried 13,002,043 passengers, and 398,328 tons of freight, according to these records. In carrying this freight, 2,041 trucks and 99 trailers were used.

Total revenue from the passenger business on motor lines in this state in 1921 was $7,991,312, with $3,408,152 received for carrying freight, and $3,431,715 realized from express receipts, mail contracts and miscellaneous other business, the whole totalling $14,831,179. The Motor Transit Co., which operates throughout Southern California, reported an income of $1,618,893. The California Transit Co., operating between Sacramento, Napa, Oakland, San Jose, Merced and Stockton and way points in central and Northern California, took in $834,295 during 1921.

Expenses reported for the various stage and truck lines for last year aggregated $14,394,601, so that the net return was $436,578. Gross revenue of more than $50,000 was reported by 23 of the stage lines, whose total revenue was $5,544,515, against expenses of $5,462,750, leaving a net revenue of $81,765, on an investment in equipment of $2,588,424. Of the freight and express lines, 20 reported revenues in excess of $50,000. Their total income was $2,060,530; expenses, $1,196,997, and net revenues, $863,533. Equipment investment in these lines is considerably less than in the passenger lines, being reported for the 20 mentioned at $683,915, so that they received a net income greater than their investment.

SOUTHERN FARM SALES IMPROVE

ATLANTA, Ga., Sept. 9—According to a compilation of sales reports from seven of the largest wholesale distributors of power farming equipment in the Southeast by the Federal Reserve Bank of Atlanta, sales during July of this year were 158.6 per cent better than July, 1921, though 7.4 per cent lower than June, 1922. While definite sales figures for August are not yet available, sales are expected to exceed those of July, and be about 160 per cent better than Aug., 1921. This report includes all farm implements, but the increases are due to increased tractor sales principally.

FRANKLIN VICTORIA COUPE

SYRACUSE, N. Y., Sept. 7—In addition to the changes in the engine and chassis which were fully described in the Aug. 31 issue of MOTOR AGE, the new Franklin models show the addition of an entirely new body, the Victoria Coupe, which is a three passenger job. The price of the new coupe is $2750. Some changes have also been made in the exterior appearance of the entire line. Most noticeable of these is the location of the front license plate bracket, which is a forging extending over in front of the left front wheel so as to remove any interference of air supply to the cooling system.

LOCOMOBILE POLICY STATED

BRIDGEPORT, Conn., Sept. 9—The reorganized Locomobile Co. of America, now headed by W. C. Durant, has issued a statement to its branches and dealers outlining its plans under the new leadership. No radical changes are contemplated either in policy or design of the product, it is stated. The Locomobile as now known, with its 48 h.p. low-speed six-cylinder engine and four-speed transmission will be continued. To build an even better, finer car at an increased cost if need be, will be the goal.

GEORGIA SECRETARY RESIGNS

ATLANTA, Ga., Sept. 11—Percy A. Megahee, executive secretary for the past few years of the Georgia Automobile Dealers' Assn., and secretary of the Georgia Motor Bus and Transportation Assn. since its organization recently, has resigned to accept a post as salesman in the Georgia territory for the Martin-Nash Co. of Georgia. Under Megahee's secretaryship, the Georgia dealers' association has been unusually active, and he has been largely instrumental in bringing about the defeat of unfavorable legislation for both this association and the bus organization.

OVERLAND'S BEST AUGUST

TOLEDO, Sept. 9—Willys-Overland reports the biggest August in its history, shipments of 14,007 Overlands and Willys-Knights being recorded as against the previous best August of 11,718 in 1917. August, 1922, deliveries were greater than those in any single month since June, 1920, when 14,033 cars were delivered.

STAR DELIVERIES BEGIN

NEW YORK, Sept. 8—Deliveries of Star cars to purchasers are now being made. The Star is in production at three plants, Lansing, Leaside and Long Island City.

Warrants Issued Against 46 Filling Stations in Louisville

This Number Out of 59 Visited by Inspectors Gave Less Fuel Than Was Paid For

LOUISVILLE, Ky., Sept. 11—A determined fight against gasoline filling managers and proprietors who deal out short measure has been commenced by the Louisville Automobile Club. Inspections made in four days by H. P. Ogden, city inspector of weights and measures, accompanied by two representatives of the club, resulted in warrants being sworn out against the managers of 46 of the 59 filling stations visited. The warrants charged the giving of short measure and the managers were booked for trial in the city ordinance court. The penalty for the offense charged is a fine of from $10 to $100.

As a result of the investigations thus far, the city inspector and Eugene Stuart, secretary of the automobile club, estimated that motorists in Louisville and Jefferson county are being defrauded of approximately $25,000 a month through short measure.

The automobile club had been receiving many complaints regarding short measure, Stuart said, and after a conference with Ogden it was decided to wage the "gasoline war."

They had a dummy gasoline tank on their automobile and would order each time five gallons of gasoline. Immediately after receiving the gasoline and obtaining a receipt signed by the person in charge of the station and the one who put the gasoline in the tank, they would drive around the nearest corner and detach the dummy tank, measuring the quantity with apparatus from Ogden's office.

The dummy tank has no connection with the automobile's fuel supply. These tests showed, they said, short measure from a few cubic inches up to several quarts. Many times the five gallon order was seven pints short, they said.

They have tested 59 stations. The result was 46 short. The average shortage, Stuart said, was 43.5 cubic inches, or 1½ pints on the five gallons.

Seven cases against gasoline filling station operators were disposed of in the Ordnance Court here. Forty more cases of similar nature on the docket were continued until Sept. 21. Six pleaded guilty and paid fines of $10. The Standard Oil Co. was fined $10 by Judge William Earl, in the specific case of the station located at Twenty-sixth street and Broadway.

Chicago Sales Somewhat Slower at Summer's Climax

Lull in Last Days of August Believed to Precede Brisk Fall Selling Season

CHICAGO, Sept. 8—A noticeable decline in the retail sales of automobiles in Chicago came with the last two weeks of August and the first few days of this month. It was coincident with a warm wave marked by the highest sustained temperatures of the summer and most dealers are of the opinion that the coming of cooler weather, expected any day, will bring an improvement in sales.

The falling off of sales, however, has not been marked enough to cause any great depression in the business. There still are dealers far behind in making deliveries and there is an increasing demand for enclosed cars. Truck sales seem to have suffered more than passenger car sales. Used cars also have been moving more slowly, some dealers having difficulty disposing readily of cars taken in trade during the rush season.

Figures compiled by the Central Automobile Finance Assn. show the trend of sales here. These figures represent the number of time payment automobile sales recorded each week in Cook county and provide an index for the business generally. For the five weeks ending July 29 these sales were 4917, but for the five weeks ending Sept. 2 they dropped to 4467, a decline of 450. The last two weeks of the period ending Sept. 2 were responsible for practically all of this decline, the sales for those two weeks being 1576 as compared with 2017 for the final two weeks of the preceding period, a decline of 441.

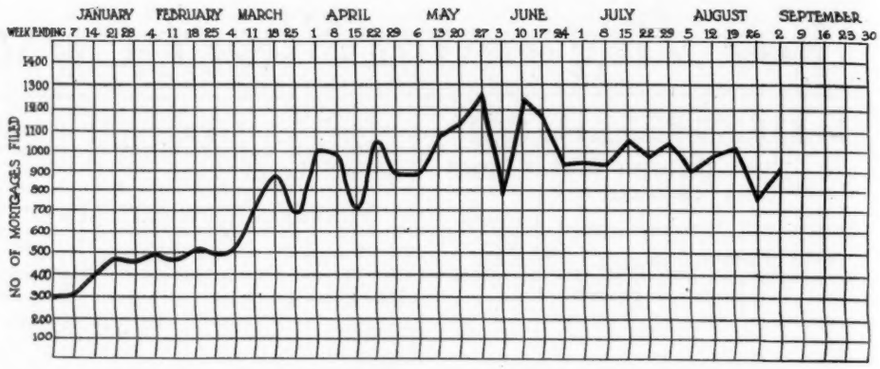
The week by week comparisons for the two periods follow:

Week ending

July 1— 927	Aug. 5— 900
July 8— 921	Aug. 12— 990
July 15—1052	Aug. 19—1001
July 22— 982	Aug. 26— 763
July 29—1035	Sept. 2— 813

The new models for the 1923 season being announced are attracting a great deal of attention as soon as they appear in the salesrooms and there is every reason to believe that the fall and winter selling will be exceptional. The Star car distributor placed two models of that car in his Michigan avenue display room this week with the result that thousands of persons inspected it daily. The dealer is taking orders for delivery in January, requiring a $25 deposit on the phaeton and $50 on the enclosed models, with an agreement to return the deposit if purchaser is not satisfied with the car after riding in it.

Sales of accessories and supplies have been exceptionally good during the summer and are still good. Important highway improvements in Illinois and Wisconsin have encouraged greater use of their cars by owners. Among these improvements is a concrete highway extending 342 miles from St. Louis to Chicago and continuing north along the shore of Lake Michigan through Milwaukee into the great vacation land of Northern Wisconsin. Automobile travel between Chicago and St. Louis has been especially heavy, it being possible to make the drive in a day, or a night.



This chart shows the trend of automobile sales in Chicago since Jan. 1, as indicated by the official record of the number of cars sold each week on the chattel mortgage time payment plan

11 Memorial Parks Presented To Detroit By Dodge Company

DETROIT, Sept. 8—Dodge Brothers, Inc., has donated 11 tracts of forest and lake sites to the state of Michigan for motorist, picnic and camping parks. The parks total 627 acres of natural woods and lakes. All of the sites are within 50 miles of Detroit.

The purpose of the donation is to provide a memorial to the late John F. and Horace E. Dodge and to "give motorists places where they may have their picnics, games and bathing without being constantly driven from pillar to pillar by indignant owners of private property."

Ten of the eleven parks have large lakes or river frontage and the other is a rugged, almost mountainous parcel noted for its natural scenery. The parks will be known as Dodge Brothers State Parks No. 1, 2, etc. The presentation was made in a formal letter to Governor Alex. J. Grosbeck by chairman Howard E. Bloomer of the Board of Directors of Dodge Brothers.

COURIER IN PRODUCTION

SANDUSKY, O., Sept. 9—The Arrow Motors Co. of this city, has changed its corporate name to the Courier Motors Co., to conform with the name of its car, which will be known as the Courier. As has been previously announced, the Arrow Motors Co. acquired the plants, assets and good will of the former Maibohm Motors Co. The Courier Motors Co. takes all these over from the Arrow Motors Co.

Production is under way on six-cylinder models, which are custom built, and it is stated that enough orders are on hand to keep the plants at capacity for several months.

Associated Motors Current Assets of $9,564,555.22

CHICAGO, Sept. 11—A condensed balance sheet of the Associated Motor Industries as of July 15, 1922, shows this holding company to have current assets of $9,564,555.52 as compared with current liabilities of $1,210,060.86. Cash is given at $1,365,939.50.

The Associated Motor Industries was formed to effect the consolidation of approximately 20 companies active in the automotive or associated industries. These companies have been divided into three groups. The first group is made up of eight companies—National Motor Car & Vehicle Corp., Indianapolis; Traffic Motor Truck Corp., St. Louis; Recording and Computing Machines Co., Dayton, O.; Covert Gear Co., Lockport, N. Y.; Kentucky Wagon Manufacturing Co., Louisville, Ky.; Jackson Motors Corp., Jackson, Mich.; Saginaw Sheet Metal Works, Saginaw, Mich.; M. & T. Corp., Atlantic, Mass.

The identity of the companies included in the other two groups will be announced later. When all conveyances are completed, the Associated Motor Industries states that the combined assets will aggregate approximately $80,000,000.

The aggregate depreciated value of the fixed assets derived from appraisal is given at $10,135,378.53.

NEW HOME FOR MOTOR CLUB

MEMPHIS, Tenn., Sept. 8—Ground was broken on Labor Day at Linden and East St. for the new home of the Memphis Motor Club, of which C. H. Hutchison is secretary and treasurer. The structure will be of hollow tile and stonecote, in two colors, with ornamental red brick trim. It will follow the curve of the drive way supported by six massive columns. The cost will be $25,000. The membership of the club now numbers about 700. The purpose of the club is to furnish mechanical, tire, battery and wrecker service to its members at nominal cost and to non-members for a legitimate charge. Attractive uniforms will be worn at all times by the employes of the club. The service cars will be white with blue trimmings.

Data Given on Use of Trucks To Haul Milk to City Markets

Large Sales Field Will Be Opened Up If Producers Adopt Plan Outlined

WASHINGTON, Sept. 8—Definite plans for haulage of milk products by motor trucks were submitted to the National Milk Producers' Assn. today by F. W. Finn, secretary, Motor Truck committee, National Automobile Chamber of Commerce. This report is very comprehensive in that it covers a new field for motor transportation of milk and milk products. It gives the concise account of motor truck operation costs from one ton to seven and one half tons, covering the operation of costs per mile to per day, per week, per month and per year. The report is submitted from the standpoint of the user and not the manufacturer of trucks and if adopted by the milk producers will mean sales of trucks on an enormous scale throughout the country.

Charles W. Holman, executive secretary of the National Milk Producers' Assn., is now giving his personal attention to the proposed motorization of milk routes. The data prepared under Finn's direction for the milk producers involves a plan whereby the co-operative organizations of milk producers will own their own trucks and manage and operate the motor transportation system. Figures are given to show that the plan, if developed, will result in tremendous savings to milk producers. The report shows that it is possible to transport milk products from farm to city markets over distances up to 50 or 60 miles at less than half the cost of rail transportation.

The success which has attended the inauguration of motor milk routes in Syracuse, N. Y., and Cincinnati, Ohio, has aroused the farming interests to the possibilities of motor truck transportation. A chapter of the report shows that in some large centers fully 90 per cent of the milk supply is now being received by motor trucks. Information given the Motor Truck committee by operators and owners of milk trucks shows that Milwaukee is enjoying milk at 11 cents a quart while the average American city is paying approximately 13 cents, owing to the high rail freight rates.

OFFICERS ELECTED AT BERKELEY

BERKELEY, Cal., Sept. 12—Nelson Scotchler, Ford dealer in Berkeley, was elected head of the Alameda County Automobile Trade Association at the annual election and dinner of this branch of the California Automobile Trade Association, held here late in August. William Mackay, of Mackay & Austin and Jack Bowers, of Brask Brothers & Bowers, both Oakland firms, are the new vice-presidents. Charles Hebrank, of Hebrank, Hunter, Peacock & Co., also of Oakland, continues as treasurer of the county organization. Robert Martland, secretary-manager of the county association—which position he also holds with the state association—was unanimously re-elected.

David Jones, retiring president of the Alameda county association, was presented with a memorial gift by the members.

Novel Prize Contest of St. Louis Velie Company

ST. LOUIS, Sept. 7—A prize contest in which credit vouchers valued at $1200 will be distributed to the winners has been announced by the Velie Automobile Co., of St. Louis. Contestants are invited to take a test trip in a Velie car, trying it for speed, economy, lack of vibration and throttling down, pick up, power, riding comfort, and then write a letter giving their impression of the car.

The writer of the best letter will receive a credit voucher for $500, with other prizes as follows: second, $300 voucher; third, $200 voucher; fourth, $100 voucher; fifth, $100 voucher. The vouchers are transferable and may be applied on the purchase price of any new Velie car. The contest closes Oct. 1. The judges are Mayor Henry W. Keil, A. R. Morgan, principal of public schools, and Franklin Miller, judge of Circuit Court.

DAVIS CARS REFINED

RICHMOND, Ind., Sept. 8—Added refinements and extra equipment which will be standard for the Davis Model 71 phaeton and Model 74 sedan in the future, have been announced by the George W. Davis Motor Car Co., of this city. There will be no increase in the price of these models.

The phaeton is now finished in either Midnight Blue or Royal Blue, at the option of the buyer, and equipped with either aluminum military steps and skirt fenders, or with regular running boards. Snubbers, both front and rear, heavy polished aluminum luggage rods on the rear body panel, front bumper, and brown Spanish leather upholstery are now standard on this model.

The sedan is equipped with snubbers, front and rear, and front bumper. Military steps, skirt fenders and luggage rods have always been standard on this model.

POST OFFICE GETS TRUCKS

INDIANAPOLIS, Sept. 9—Three hundred three-quarter ton truck chassis, which formerly belonged to the army and were stored at Ft. Benjamin Harison near here, were this week taken by the Post Office Department and moved to the department's Beach Grove repair shops, located in this city. Early in the week, Ira P. Dawson, superintendent of chauffeurs and motor equipment of the postal department, came to Indianapolis to superintend this work.

Sales in Los Angeles Drop Off a Little Now

August Decline Comes But Dealers Believe Business Will Be Good

LOS ANGELES, Sept. 9—August showed very little diminution in the demand for motor vehicles. Sales ran somewhat behind those of July, but this is customary in August. Several dealers cannot make deliveries and that is another reason for the falling off in sales. These dealers claim they get no encouragement from the factories and at least two firms claim to be from 30 to 60 days behind their orders.

Unless every indication fails, this year will prove the biggest on record in Southern California. Dealers in the surrounding small towns again are active and there is a marked demand for representation, especially among the better known lines of passenger cars.

Through the organization of finance companies, dealers are finding it easier to get their time payment paper handled. The banks are showing no particular desire to lend their money, but it is a known fact that the very banks which have refused to accommodate the dealers have organized and financed funding companies which serve the purpose but absolve the banks direct from the risk.

STATE FAIR WILL DRAW FARMERS

SPRINGFIELD, Ill., Sept. 8—Motor car, truck and tractor dealers of Springfield always regard the state fair as a big asset in their business and take advantage of it to the fullest degree possible. This year's fair will open Saturday, Sept. 16, and continue one week. At a meeting of the automotive dealers' association, it was unanimously voted to increase the number of cars on display and also take a greater amount of space for trucks, tractors and accessories.

Committees were named to allot the space and have charge of other arrangements. In former years, the dealers here have traced considerable business to the annual show in connection with the fair. This season, with farmers in a buying mood, due to bumper crops and good prices for their grain and live stock, the dealers believe that they should make a greater effort than ever to interest the rural prospects.

The Illinois state fair is essentially an agricultural exhibition and its various features have a greater appeal to the country than to the city. For this reason, the dealers here will cater to the rural buyer, and will endeavor to interest him on all lines, motor car, truck and tractor.

GOOD DEMAND IN PHILADELPHIA

PHILADELPHIA, Sept. 9—Automobile dealers generally report a good demand for all classes of cars, the trend being toward enclosed models, as was expected. Other automotive lines remain unchanged since last week.

Tennessee Bus Lines Prove Worth of Motor

Automobile Transportation in South Is Big Success

MEMPHIS, Tenn., Sept. 8—Several bus lines radiate from Memphis now and these trucks do a good business every day. The Blue Bird Bus Line operates cars on daily schedules to Collierville, Tenn., Olive Branch, Miss., and other points. The sides of the cars carry artistic advertisements.

The Gregory Bus Line at 43 South Second St., has a line of motor busses making points in the tri-states, Arkansas, Tennessee and Mississippi.

The Cooke Transportation Co., 73 Monroe Ave., opposite the Peabody Hotel, goes to Crawfordsville, Ark., Wynne, Ark., Wilmer, Ark., and many other points and to several towns in North Mississippi.

The Ellis Bus Line, with handsome green cars, is one of the new ones in the field and makes daily schedules to Kerrville, Tenn.

The Williams Bus Line is another new one with handsome cars covering local points.

The North Memphis Bus Line Co. for the citizens of North Memphis is brand new and the stockholders are issued tickets.

A new bus line company for South Memphis and the Fort Pickering section will be launched in a few days.

DALLAS HAS NEW BUSINESS

DALLAS, Tex., Sept. 9—Dallas has a new kind of automobile business. Its the Humorey Motor Title Co., a concern which is undertaking to eliminate automobile thefts, protect purchasers and owners and halt fraudulent sales of negotiations for loans, through an abstract of title to every motor vehicle. The abstract would show the make of vehicle, various serial numbers, when bought, from whom and by whom from the factory on down. Headquarters will be maintained in Dallas.

BEARINGS SERVICE CO. TO DISSOLVE

DETROIT, Sept. 8 — The Bearings Service Co. as an active organization will be dissolved Dec. 31, 1922, according to an announcement by Alfred K. Hebner, president and general manager. The concern was incorporated June 26, 1916, and functioned through 32 direct branches and approximately 1000 distributors as the service department of the Timken Roller Bearing Co., the Hyatt Roller Bearing Co., and the New Departure Mfg. Co.

Thereafter the servicing of the New Departure and Hyatt bearings, the manufacturers of which are units of the General Motors Corp., will be handled by the United Motors Service, Inc., and a new company to be known as the Timken Roller Bearing Sales & Service Co., will care for the servicing of Timken bearings. The three manufacturers will continue friendly relations and the two new servicing companies will reciprocate in providing service at points where only one has representation. It is said that the new arrangement will result in as good if not better service to the public than the old arrangement.

Farmers Lead in Car Ownership in Quebec

TORONTO, Ont., Sept. 9—An analysis of passenger car registrations for the year just completed for the Province of Quebec shows the farmers away in the lead as owners of passenger cars.

Farmers had nearly 65,000 cars to their credit. Tradesmen come rather a poor second with less than 24,000—23,680 to be exact—to their credit. Merchants are third with 16,700 cars, and the unoccupied class comes next with 11,369 machines. Class ownership for the remaining number of cars is as follows: Professional, 6,748; manufacturers, 4,820; doctors, 3,934; liveries and garages, 5,187; commercial travellers, 5,311; firms, 2,623; real estate agents, 1,098; cartage agents, 5,408; contractors, 2,961; undertakers, 406; clerks, 3,969; laborers, 4,059; managers, 8,018; police, 303; drovers, 651; soldiers, 114; unclassified, 7,985; municipal corporation, 212; public utilities commissions, 130; banks, 142; railways, 17; Dominion government, 155; Ontario government, 204; hospitals, 7.

PROGRAM COMPLETE FOR M. A. M. A. MEETING

NEW YORK, Sept. 8—Plans have been completed for the sixth annual credit convention of the Motor and Accessory Manufacturers' Association, which will be held Sept. 13-15 at Hotel Lafayette, Buffalo. In connection with the credit convention there will be special conferences on advertising, export and traffic which will be addressed by speakers of national prominence. It is to be the greatest convention effort ever made by the association.

MAKING DURANTS AT OAKLAND

OAKLAND, Cal. Sept. 8—The first carload of automobiles built at the new plant of the Durant Motor Co., in Oakland, was shipped to Seattle late in August, to W. S. Dulmage, distributor of the Durant car in the state of Washington. Officials of the Durant company were present at the loading of the first car. Following this first shipment, sixteen more carloads of Durants were shipped to Dulmage for distribution in his territory.

NEW CANADIAN TRUCK COMPANY

TORONTO, Ont., Sept. 11—Following the death of R. S. Harmer, his son-in-law, Herbert K. Patterson, of Winnipeg, has taken over his interest in the Harmer-Knowles Motor Truck Co., Toronto, and has organized a new company to be known as Harmer-Knowles Motor Truck Co.

Tractor Sales Are Great in Past 60 Days

Dealers Expect Biggest Six Months in Georgia History

ATLANTA, Ga., Sept. 8—According to reports received early this month from several southern managers of tractor and power farming equipment manufacturers, many of whom have southern offices in Atlanta, tractor sales during the past 60 days were about 60 to 70 per cent better than during the spring months. The outlook, these managers say, in many times better than it has been since the summer of 1919, and most of them are looking forward to the biggest volume of business in tractor sales during the next six months the industry has experienced in this section. They base this prediction on daily reports received the last two or three weeks from field men over the entire district, who declare that the southeastern farmers are in better shape financially than they have been in more than three years.

This year's cotton crop estimated at well over 10,000,000 bales, will bring the growers millions of dollars, the farmers making a real profit off of cotton for the first time since the war. While much of this money will be needed with which to liquidate their debts, enough will be left to enable the farmers to buy such equipment as they need. Dealers throughout the section are advising the Atlanta branch managers that they have three to four times as many live prospects for tractor sales as they had a year ago, and ten times as many as two years ago.

UNIVERSITY GIVES INSTRUCTION IN AUTOMOBILE MECHANICS

BERKELEY, Cal., Sept. 12—The University of California announces several courses in automobile mechanics to be offered by the extension division this year. One of the courses is for car owners, designed to teach them the mechanism and the mechanics of their own car. Instruction will be given in these branches on any car owned and driven by the applicant for the course. Another course of the same kind is offered exclusively to women. Still another course is for shop mechanics who wish more advanced training, and there is a fourth for chauffeurs, truck and bus drivers, and men similarly connected with the operative end of the industry. Instruction will be individual in all the classes.

R. C. DURANT TO RACE AT KANSAS CITY

OAKLAND, Cal., Sept. 11—R. C. Durant, now a motor-car manufacturer, but formerly a speedway and road-race automobile driver, announces that he will return to the speedway for a final appearance. He has entered the Kansas City Speedway Inaugural, scheduled for Sept. 16, and will drive a Durant Special in that race.

Fordson Caravan Reaches Portland After Month

Success of Demonstrations in All Towns "Made" Is Shown

PORTLAND, Ore., Sept. 9—After a series of demonstrations occupying nearly a month, during which practically every city and town in central western Oregon from the California state line to Portland was visited, the Fordson tractor caravan and power farming demonstration has reached Portland. The demonstration is being carried out by the Oregon branch of the Ford Motor Co., the Standard Oil Co., and a number of companies handling power farming implements.

Upon its arrival here the caravan disbanded for a few days while those in charge secured a brief rest. It will start out again next week, going west into the Tillamook country on the coast and will spend the month of September visiting the coast and Columbia river towns. Upon its second return to Portland the caravan will stage a giant demonstration in Portland, to occupy two days, and will then disband.

The caravan thus far has met unusual success, according to Manager Goodwin, of the Oregon branch of the Ford company. In every town at which they stopped wide publicity was given to the demonstration and a virtual holiday was provided. Stores and business institutions in the various towns cooperated in a splendid way, assisting in drawing in the farmers from the outlying districts. In many instances the crowds attending the demonstrations numbered several thousand people.

"Not only was the demonstration a big success in attendance and in interest shown," said Goodwin, "but it has brought splendid results in the way of actual business. Following the demonstrations efforts were always made to follow up the advantages thus attained and a large number of orders were secured on the grounds."

The caravan, it is declared, has already ushered in a period of buying throughout the section which it has visited thus far, after a period of about two years in which there has been practically no buying of power farming equipment.

HIGHWAY SAFETY CONFERENCE

CHICAGO, Sept. 8—A conference of highway commissioners, railroad officials and presidents of automobile clubs in Illinois has been called by the Illinois Commerce Commission to meet at Springfield Oct. 30 to plan a campaign for the purpose of reducing the number of accidents to automobiles at railroad crossings.

Such accidents have increased rapidly, according to the commission, notwithstanding the precautionary measures taken by the railroads and highway officials in installing warning signs and bells at all dangerous crossings.

It is the purpose of the Commerce Commission, after a full hearing which will be public, to issue a general order dealing with the situation.

FORD TO BUILD JACKSONVILLE PLANT

ATLANTA, Ga., Sept. 11—According to an announcement in Atlanta, the Ford Motor Co. expects to start the construction of a branch assembling plant at Jacksonville, Fla., within the next few months, to handle the business of the dealers in South Georgia, Southeastern Alabama and Florida. Plans for the factory have already been drawn, according to Slocum Ball, manager of the Jacksonville branch, and it is expected to have the plant ready within another year.

A Good Car for Every Family in America

MOLINE, Ill., Sept. 7—"Population used to be the point to which automobile statisticians related their predictions of 'saturation.' Today, with one motor vehicle to every ten persons in the United States, there seems to be a fallacy in the problem of saturation predicated on population," said F. E. Bradfield, vice-president of Velie Motors Corp. "Iowa alone expects to have one car registered for every 5.2 persons by the end of the year. California has a car for every 5.3 persons. In the middle western states as a group there is a car for every 7.7 persons.

"A more logical proposition would be to relate the number of cars to the nation's wealth. When it is considered that with all its millions of wealth in use, the United States still has an untapped wealth of 150 billions, the point of car saturation appears to be a long way off.

"For our country's prosperity means cars—and more cars. There is no utility, comfort, convenience or luxury that ranks higher in the esteem of Americans. And justly so. The car has done and is doing more to develop our country socially, commercially, in every way, than any other one factor. A good car for every family in the country is a distribution that may well be desired."

BIRMINGHAM SHAREHOLDERS TO WAIT

BUFFALO, Sept. 7—At a meeting in Falconer of shareholders of the Birmingham Motors, a motion to dissolve the trust and incorporate under the laws of New York state was tabled until the annual meeting, to be held in October. A proposition made by George B. Mechem, Sr., fiscal agent of the company, to withdraw from it, was accepted.

Los Angeles to Buy 107 Motor Trucks

City Believes Public Ownership Is Better Than Renting

LOS ANGELES, Sept. 8—The city of Los Angeles is finding it difficult to buy a large number of motor trucks. The city rents more than 100 trucks and pays out approximately $350,000 annually in rentals. One councilman declared it would be cheaper for the city to own and operate its truck and finally induced the body to decide upon the purchase of 107 trucks.

The council supply committee refused to assume the responsibility of making the selection and the city engineer was instructed to investigate and recommend the make of trucks to be bought. After a very exhaustive investigation and the receipt of bids and specifications, he recommended 107 Mack trucks be purchased. This did not please the council because only one make was endorsed by the engineer and it was decided to reduce the order from 107 to 66 and split the order between the Mack, Moreland, G M C and Garford. The payment on the trucks was to be in the nature of rental and spread over a period of three years. The Mack Company informed the council its bid had been entered on the basis of 107 trucks and the same prices would not apply on a less number so its bid was withdrawn.

The order then was divided equally among the Moreland, Garford and GMC bidders. Talk of graft and grand jury investigation has entered into the deal and although the city attorney has been instructed to draw up the contracts, final action is being held in abeyance. The mayor, who must sign the contract, has stated he believes it illogical to buy several different makes of trucks and he questions the legality of the entire deal because the bids were advertised for on the basis of 107 trucks and the number subsequently was reduced to 66.

USES CRUDE OIL IN TRACTOR

JANESVILLE, Wis., Sept. 4—Crude oil in its raw state, as it gushes from the ground, was successfully used as fuel in a kerosene tractor engine by the Townsend Mfg. Co., Janesville, Wis., in special tests made during the past week. The oil came from a well in Montana owned by Janesville capital. It differs from the Texas crude in that it resembles ordinary lubricating oil in color and consistency. The Townsend engine operated as well, judging by all appearances, as it does on kerosene fuel. Further tests will be made before the Townsend tractor is put forth as adapted to crude oil. Work along this line has been going on in the experimental shops for a year or longer, it being recognized that crude oil use represents a large economy. Crude costs 3@4c per gallon, kerosene 16@18c per gallon.

Future of Electrical Service Discussed

Manufacturers of Equipment Favor Standardizing Types

Car Dealer Often Lacks Adequate Testing Outfit and Expert Workmen

OLD ORCHARD, Me., Sept. 7—Whether the motor car dealer or the special electric service shop will do the repairing on starting, lighting and ignition apparatus on motor vehicles was one of the main topics considered by the Automotive Electric Association which is composed of the manufacturers of this apparatus, at its four-day annual convention just completed here.

The manufacturers of electrical equipment are not all agreed on this. Some of them favor the car dealer doing this work, providing he has satisfactory equipment to make electrical tests and, further, that he has at least one workman who can meet the requirements of the electric manufacturers in his knowledge of electricity and making electrical repairs.

The other school thinks that electrical equipment will be best serviced by special electrical shops of which there are many throughout the country and where these shops, in some cases, are the official service stations for a dozen or more different makers of starting, lighting and ignition equipment. These stations, before they can be officially designated as such, frequently have special electrical equipment to the value of $1,000 and, not infrequently, special tools to the value of $200 or more.

It is certain that whether electric service is done by garages or special electric service stations, it must be done by workmen who have an adequate knowledge of electricity and are competent to make the repairs.

One large electrical manufacturer reported making an investigation of the motor car dealers in a territory and discovered that only 1 per cent of them were competent by way of equipment and experienced electrical workmen to do electrical work. Naturally, in such a territory, all of the manufacturers of electrical apparatus are backing the exclusive electrical service house where there must be experienced help.

The greatest difficulty with electric service is in the small town of a thousand population and perhaps up to 2,500, where the exclusive electric shop has had difficulty existing. In such places, the motor car dealer attempts to do the electric service work particularly during seasons when motor car sales are slack. Not infrequently, this car dealer turns the electric repair work over to the electric service station when he is busy selling motor cars. A great difficulty with the electric repair shop in the small town is that the man in charge is frequently not a good merchant. He is an expert electrician, has good machine tools and has a stock of parts but he lacks the ability to get the car owners to bring their work to him. In short, he is not a good merchant. Making better merchants or business men out of these electric service people is one of the problems that the Automotive Electric Association has in mind.

One plan wherein the motor car dealers cooperate with the local service station is in using the registration plan. By this plan, when a car dealer sells a car, he gives the purchaser a card of introduction to the local electric service station which is equivalent to telling the owner that he should take the electric service to that place. The reason for the dealer turning the service over is that he does not care to put in the necessary machine equipment and engage an expert electrician as demanded by the maker of the electric equipment on the car he sells. Most of the motor car manufacturers do not guarantee the starting, lighting, ignition and battery in their 90-day warranty, and, consequently, the makers of this electric apparatus feel that the car dealer, when he does not stand back of this apparatus, should turn the service over to the electric repair shop which is the official representative of the electric maker who guarantees the product.

The twelve or more manufacturers of starting and lighting equipment are engaged on a comprehensive plan of standardization which should greatly reduce the number of different models of generators and starting motors, so that the problem of servicing these and carrying adequate stocks of parts for them should, in the next years, be materially simplified.

Their plan of standardization of electric generators is this:

They hope to have, perhaps, six different sizes of generators to be known as No. 1, 2, 3, 4, 5 and 6. It is hoped that each manufacturer will confine his manufacturing efforts to practically these six sizes. No. 1 would be for the small four-cylinder cars with high speed engines. No. 2 might be for the medium priced six-cylinder cars. No. 3 would be for the higher grade of cars. No. 4 would be for the highest priced cars. No. 5 would serve for motor busses and No. 6 would serve for aircraft and railroad gasoline cars.

Similarly, the number of starting motors would be greatly reduced and the different manufacturers would build to these sizes.

When the number of sizes would thus be reduced, the problem of standardization would be carried further so that, probably, brushes in the different generators would be interchangeable among different manufacturers. Bearings might be made interchangeable as well as lubricating devices. The whole plan would be to not only simplify service but greatly reduce the number of different parts.

SHIPMENTS MOVING HERE

BIRMINGHAM, Ala., Sept. 9—Shipments of automobiles into the Birmingham district were being received more promptly during the past week than during the month previous to that time. A number of concerns stated that they had received cars and others that notices indicated early delivery of cars.

Just as soon as cars can be delivered into Birmingham, the dealers state that in their opinion they can be sold. The recent announcement of the United Steel Corporation that they would increase the pay of their common labor 20 per cent, followed by the announcement of the coal operators of Alabama that they would do likewise and then by several of the independent furnace and iron concerns stating that their increase would be effective the same date, has affected about 50,000 men in Birmingham directly and caused the entire city to put on "boom" optimism.

GASOLINE TAX FOR ROADS?

CHICAGO, Sept. 7—A state gasoline tax is proposed by Gov. Small to finance further good roads construction in Illinois. The state is now expending the proceeds of a $60,000,000 bond issue to build hard roads and the Governor favors an additional bond issue with interest and sinking fund to be provided by a gasoline tax. The Governor said:

"I expect to recommend the law to the next session of the legislature. The people want roads. I believe that the entire bond issue would be paid by automobiles. I believe that a truck should pay its proportion in relation to its earning capacity. A gasoline tax is the surest and fairest way of getting at a basis."

RADIO CARAVAN STARTS TRIP

ST. LOUIS, Sept. 8—A radio caravan consisting of Overland and Willys-Knight passenger cars and Overland commercial cars equipped with a radio receiving set started Aug. 21 from the Willys-Overland factory branch in St. Louis, on a two months' tour of the principal towns in the St. Louis territory, giving radio concerts and demonstrations.

The daily program which consists of music, baseball scores, market reports and late national news is furnished by the St. Louis Post-Dispatch Radio broadcasting station K. S. D. F. T. Windle manager of the St. Louis Willys Overland Branch is sponsor for the caravan. During the past week concerts and demonstrations were given within a radius of ten miles of St. Louis.

Federal Court to Pass On Confiscation of Cars

Ruling Expected as to Rights of Dealers in Vehicles Seized When Carrying Liquor

ST. LOUIS, Sept. 8—Dealers in various sections of the country who have been concerned over the seizure of motor vehicles detected in illicit transportation of intoxicating liquors will be interested in a decision which may be expected shortly in the federal courts involving the seizure of cars.

There is now before the Circuit Court of Appeals for the Fifth District, comprising several of the Southern States, a case on appeal from the district court in which it is held that the National Prohibition Act (the Volstead law) supercedes a section of the Internal Revenue Act applying to confiscation of vehicles illegally carrying liquor.

The section of the revenue act in question provided that when a vehicle is detected carrying liquor in violation of law it would be automatically confiscated with no protection for a lien holder, regardless of his guilt or innocence in the case. Under this law, a dealer who had sold a car on time payments to a man who later used it for "bootlegging" would lose the money which the car owner still owed him. Section 26 of the Volstead law provides that when a car is seized for carrying liquors the car may be sold at judicial sale and the proceeds turned over to the United States treasury after all bona fide liens are satisfied. This would give a dealer protection for his mortgage on a car where he had no knowledge of the owner's wrongdoing. It has been interpreted to mean that he is entitled to the amount of his lien out of the proceeds realized from the sale of the car but not the return of the vehicle itself.

Despite the provision of the Volstead law, Federal authorities in several of the Southern States continued to confiscate cars without protection for dealers who had sold them on time. They are still operating under the original revenue act provision.

In the case now on appeal the district court held that the Volstead law, insofar as it relates to liquor, provided a new system of law and repealed the section of the Revenue Act referred to. The United States attorney in the case appealed from the decision.

If the circuit court of appeals upholds the lower tribunal, the case might be carried to the United States Supreme Court as a final test. If the case as finally adjudicated upholds the Volstead law provision, federal authorities will have to cease confiscation of dealer rights in cars illegally operated by owners without the dealer's knowledge. If the final decision upholds the old Revenue Act provision, the National Automobile Dealers' Association will resume its efforts to bring about passage of a bill introduced by Senator Dial, of South Carolina, clearing up the conflict in the statutes so as to protect the rights of innocent dealers.

Cleveland Club Offers Traffic Clearing Service

CLEVELAND, Sept. 7—The Cleveland Automobile Club has offered to undertake the relieving of traffic congestion that is caused by automobile wrecks. Secretary Fred H. Caley has informed public officers throughout Cuyahoga County that the first aid facilities given members of the club are at their disposal. Fifty service garages scattered throughout the county may be called to clear away wrecks that block traffic.

TRAFFIC REGULATION TO BE DISCUSSED

PORTLAND, Ore., Sept. 8—Discussion of appropriate legislation dealing with regulation of motor vehicle traffic on the highways, with a particular view to uniformity throughout the Pacific coast, is the subject of a proposed conference of officials of the seven western states and British Columbia which probably will be held in Portland late in September.

Letters suggesting the conference were sent out this week by Sam A. Kozer, secretary of state of Oregon and in charge of motor vehicle control, following an exchange of ideas with L. D. McArdle, director of efficiency, and Fred J. Dibble, director of the bureau of licenses, of the state of Washington.

Officials to whom invitations have been sent by Kozer and who probably will be in attendance at the conference are: Charles J. Chenu, superintendent of the motor vehicle department of California; Robert O. Jones, secretary of state of Idaho; Charles T. Stewart, secretary of state of Montana; George Brodigan, secretary of state of Nevada; H. E. Crockett, secretary of state of Utah; L. D. McArdle, director of efficiency of Washington; and the director of the motor vehicle department of British Columbia.

Bordino, Driving Fiat, Wins First Race on Monza Speedway

Completes 373 Mile Run in 4 Hours 38 Minutes in Heavy Rain—No Tire Changes Made

MILAN, Italy, Sept. 7—(By Cable)—The opening meet on Italy's first automobile speedway took place Saturday and was a complete success. The new track, called the Monza Speedway, which is 6½ miles to the lap, is located within six miles of Milan and was built by the city itself so that Italy's automobile industry may have a suitable course on which to try out cars and also promote sporting events of an international caliber.

This was the first of two races scheduled for September, the other being the Italian 500 mile Grand Prix for cars of 122 cu. in. piston displacement for which are entered 38 cars representing France, Italy, Germany, Austria and England.

The race Saturday was at 373 mi. for 91 cu. in. cars, the winner being Bordino, who competed in several California races in the United States last winter. He drove his Fiat to victory in 4:28:38. Lampiano, Fiat, was second, in 4:34:12 3/5; Salamano, Fiat, third in 4:35:48. Ramassotto, Chiribiri, Pocher and Haiden in Austro-Daimlers were still running when the race was called off. Nine cars started.

A heavy rain fell throughout the running of the event, but no accidents were recorded. A remarkable feature of the contest was that no tire changes were made.

So well pleased are the Italians with the success of the track that the City of Milan is considering sending a national Italian team to the Indianapolis speedway race in the United States next spring.

LOS ANGELES SHOW NOV. 11-19

LOS ANGELES, Sept. 8—The Motor Car Dealers' Assn. will hold a show Nov. 11 to 19. This will be the first show in this city for two years.

A stretch of the Monza Speedway, near Milan, Italy, where Bordino, driving a Fiat, won the first race on this, the second race track to be built on the continent of Europe

Los Angeles Buyers Protest Advertising of Factory Prices Only by Automobile Dealers

Cost Delivered, with Freight Charges and Tax Added, Is So Much Higher That Some Prospective Purchasers Turn Away in Amazement

LOS ANGELES, Sept. 11—The public has begun to protest against the practice of Los Angeles motor car dealers advertising factory prices only. Letters have been printed in newspapers signed by motorists calling attention to the misleading information derived from the advertising. One correspondent claims he was so disgusted upon learning the difference between the advertised and delivery prices that he decided to keep his old car.

The freight differential between factory and local prices is quite high. In many instances it is more than $200. This means that when a prospective buyer reads an advertisement and learns the advertised price is $1495, but later is told that means the price in Cleveland, Detroit, or some other eastern manufacturing center, and in Los Angeles the car costs $1735 or some such figure, he has cause for complaint. Many of the dealers use very large display type setting up the price and below it type of very inconspicuous size, stating "Freight and war tax extra" or "F.O.B. Detroit."

When asked why they advertised in this way, some dealers said it was because the factories will not permit them to change the prices to correspond to the actual cost delivered in Los Angeles. They admit they are caused a lot of grief by this kind of advertising, but, owing to the fact that the factory usually pays a percentage of the cost of advertising they are not privileged to make the change. Other dealers are frank enough to say they advertise factory prices because they are so much lower than delivery prices and if they can get a prospect to look at the car and take a ride in it they don't have much difficulty in selling the freight charge, when, if they advertised actual delivery prices, the prospect might not come into the place.

Motor Busses to Replace Street Cars

SPARTANBURG, S. C., Sept. 7—The abandonment of the street railway system operated here by the South Carolina Light, Power & Railways Co., recently purchased at a receivership sale by the bondholders, has been proposed, a motor bus service to be instituted to take the place of the street cars. In making the proposal to the city, the new owners set forth that after considerable investigation of the pros and cons of the motor bus service it had been decided that the installation of an up-to-date system would not only prove more advantageous than street cars, but enable the operating company to make money at the same time. It is likely that the proposition will be accepted by the city.

COLUMBUS SHOW A SUCCESS

COLUMBUS, O., Sept. 9—The annual fall show under the auspices of the Columbus Automobile Show Co., held at the Ohio State Fair Grounds, Aug. 28 to Sept. 2, inclusive, was a success in every way. The display of passenger cars was much larger than in former fall shows and one large building, 100 by 400 feet, was taken up with the display. Only passenger cars were in the building as space in other buildings was provided for trucks.

Business at the fair was better than last year, according to the dealers and manufacturers in charge of the various exhibits.

SUCCESSFUL ANDERSON CONVENTION

ROCK HILL, S. C., Sept. 7—The convention of dealers and stockholders of the Anderson Motor Co., held Thursday and Friday, was a decided success. The new light six was enthusiastically received and the company reports that in 10 minutes 4,500 cars representing an amount over $5,000,000 had been ordered by the dealers.

The annual meeting of the stockholders of the Anderson company resulted in the election of the following officers: John G. Anderson, chairman of the board; J. W. Anderson, president; W. A. Anderson, vice-president; C. J. Henry, treasurer; E. H. McConnell, secretary.

N. A. C. C. TO STUDY TAX BILL

NEW YORK, Sept. 8—Members of the National Automobile Chamber of Commerce have been asked by General Manager Alfred Reeves to study those sections of the tariff bill which pertain to the automotive industry and to express their views to the senate conferees, who are whipping the measure into shape for final consideration. It is expected that the bill will be ready for President Harding's signature about the middle of October.

PROVIDENCE INSTALLS BUSSES

PROVIDENCE, R. I., Sept. 9—The United Electric Railways Co. of Providence, has placed an order for six 25-passenger Republic busses, as an adjunct to their rail system.

Anti-Truck Propaganda Used By Traction Firms

State Associations May Be Asked To Combat Enemies of Motor Transport

WASHINGTON, Sept. 7—It is expected that the Bureau of Public Roads will call upon the various state highway commissions and good road organizations throughout the country to combat the insidious propaganda against motor truck transportation. Both manufacturers and owners of motor vehicles, especially trucks, are making vigorous protests against the methods adopted by electric railways to secure freight traffic which is now transported over the highways.

The tone of the letters filed with government officials indicates that the motor transport people are willing to take their chances in competing against trolley lines for business, when the competition is conducted on legitimate lines. However, objection is made to the derogatory statements as to the destruction of highways by trucks and cost to the taxpayers which has no foundation in fact.

Organized transfer and warehousemen in Indiana, Ohio, Michigan, and New York, have appealed to the Federal government to make public actual findings relating to the need of good roads and highway transportation. The display of large advertisements in traction cars in these states is calculated to arouse public sentiment against motor truck operators and owners. Farmers and other taxpayers are now wondering whether the cost of building good roads is worth while. The transportation officials point out that the majority of American taxpayers are now cognizant of the fact that highways are a good investment. The reaction of this propaganda is decidedly harmful to the good roads movement.

For instance, copies of the advertisement received by Federal officials show that the traction companies are deliberately misrepresenting facts to the reading public. One advertisement reads "PROBLEM IN ECONOMICS—SHIP BY TRACTION AND SAVE THE HIGHWAYS. If a heavy truck earns 50 cents per mile and damages the Public Highways to the extent of one dollar ($1.00) per mile and the shipper of freight saves nothing and the truck owner keeps the 50 cents and the TAXPAYER pays the dollar, WHERE DOES THE TAXPAYER GET OFF?"

It is believed that the various automotive trade associations will take an active part in assisting the Federal government to set the public right on the highway situation.

1,000 GRAYS IN AUGUST

DETROIT, Sept. 8—Gray Motors Corp., reached a production of 1,000 cars for the month of August. Production is now going ahead on a schedule of 60 cars a day and unless the coal shortage causes a curtailment,

IN THE RETAIL FIELD

Courtney and Cannon, Inc., York, S. C., has been chartered with a capital stock of $20,000 to deal in automobiles, trucks and tractors. S. L. Courtney is president; J. R. Cannon, vice-president, secretary and treasurer.

Gorman Motor Sales Co., of which W. A. Gorman is president, has purchased the H. & S. Overland plant, 519 Fourteenth street, Moline, Ill., and in addition to the Overland and Willys-Knight lines, will show a complete Studebaker line.

W. H. Wortmann, 349 Payson street, Kewanee, Ill., has taken agency of the Traffic Motor Truck Corp. of St. Louis.

The automotive dealers of Victoria, B. C., held a monster picnic recently when upwards of 800 people attended. Every prominent automotive dealer in the city was represented.

The Peerless Motor Co. has been incorporated at Cleveland, Ohio, with a capital of $100,000, to deal in motor cars and accessories. The incorporators are D. A. Burke, W. H. Collins, J. F. Porter, F. A. Trester, and E. R. Cameron.

The Cookson Motor Car Co. has been incorporated with a capital of $25,000, to deal in motor cars and accessories at Dayton, Ohio. The incorporators are C. R. Cookson, R. H. Brundrett, Roland C. Landis, A. F. Hullinger, and Ralph P. Dixon.

Homeier-Whorley Motor Co. has been incorporated with a capital of $25,000, to deal in motor cars and accessories at Akron, Ohio. The incorporators are A. L. Homeier, Merton M. Whorley, Pierce A. Snyder, Z. M. Whorley and C. H. Stahl.

Nash Motor Car Co. has sold the premises at the southeast corner of North Broad and Thompson streets, Philadelphia, to Joseph J. Greenberg who will erect thereon a five-story automobile sales and service building.

Strong & Manley, Eagle River, Wis., have started work on a new sales and service building, 60x120 ft., estimated to cost $20,000 equipped.

Makie & Jakela, Catawba, Wis., have sold their garage and repair shop business to John A. Cronce, of Prentice, Wis., who took possession Sept. 1.

Jaeger-Dowling Motor Co., Neenah, Wis., Ford dealer, is erecting a fireproof sales and service building, 75x119 ft., at a cost of $25,000.

Hall Bros., Rubicon, Wis., with a branch at Woodland, Wis., have been appointed Durant and Star dealers.

Frank J. Ruggaber, proprietor of the Diamond Battery Service & Auto Supply Co., Racine, Wis., is a voluntary bankrupt with liabilities of $2,364 and assets of $4,532.

Herbert Winkler and W. A. Brown, of Florence, Wis., have formed a partnership to take over the Oldsmobile franchise in Florence and Iron River, Wis., and Crystal Falls, Mich.

Waukesha Auto Sales Co., Waukesha, Wis., Buick and Chevrolet dealer, has divided its business. The present sales and service building on North street will be maintained as an exclusively Chevrolet station, while the Buick will be handled and serviced at 107 Barstow street, under the name of Andrews-Buick Co. William Steinemann is manager of the Buick division.

W. Frank Horn Co., 262 Fourth street, Milwaukee, jobber of and dealer in automotive equipment, has been made defendant in involuntary bankruptcy proceedings by the Philadelphia Storage Battery Co., Knapp Co., Inc., New York, and H. H. West Co., Milwaukee, three creditors with claims totalling $970.

Russell Mfg. Co. of Illinois has been chartered to do business in Wisconsin, with local headquarters at 534 Edison street, Milwaukee. It is capitalized at $10,000, of which $1,000 will be invested in Wisconsin business, according to the application for a charter. The concern manufactures and deals in automotive equipment.

Edwards Motor Co. of Milwaukee has been incorporated with a capital stock of $200,000 by Frank J. Edwards, head of the present Edwards Motor Car Co., 2713 Grand avenue, Dodge distributor and dealer. A new sales and service building costing $125,000 is being erected at Grand avenue and Thirty-fifth street.

Stutz Wisconsin Co., Milwaukee, has been organized by William M. Maxwell, with offices at 306 First Wisconsin National Bank building, and sales and service headquarters at 305 Agden avenue. Herbert A. Stolte has been appointed manager of retail sales, and James Hutton, service manager. The local dealership will be operated as the Wm. M. Maxwell Co.

The Stutz car, which has not been represented in Omaha for the past two years, is now represented here by the organization of the Stutz Sales and Service Co. under the management of T. H. Campbell.

The Tri-State Tire Co., 633 Monroe avenue, Memphis, Tenn., has been recently appointed distributor for the Ajax tires, according to Russell G. Blair, president.

Corydon Motor Co., Ford and Fordson dealers at Corydon, Iowa, have just moved into a new two-story building which is built on the same site as their building that burned last fall.

A. G. Graben Motor Co. has moved into their new home at 1436-38 Locust street, Des Moines. This concern is distributing Durant cars in Des Moines and surrounding territory.

Laurence Auto Co., dealers in used cars in Des Moines, Ia., has moved into the building formerly occupied by the A. G. Graben Co. at Locust and 12th street.

Chase Nash Franklin Co. has moved into a larger building at 120 Locust street, Des Moines, Ia.

New Bethlehem Dealer Contract Is Permanent

NEW YORK, Sept. 7—The Bethlehem Motors Corp., manufacturer of the Bethlehem truck, has developed a contract with dealers, which will embody the best features of usual truck contracts, but will be on a perpetual basis, automatically renewable year after year, so that Bethlehem dealer connections will be permanent connections of the new corporation.

The new contract provides for a stipulated number of deliveries during the first year—the number of trucks specified being on a conservative basis, in many instances only half the quantity the distributors and dealers estimate their territory will absorb. If the quota in the first year is taken, the contract continues for the second year, with an increase of 25 per cent in delivery specifications for the second year period, and a similar increase each year thereafter.

A sliding scale of discounts is used, depending on the size of the territory and the number of deliveries.

PROPOSE DYER ACT AMENDMENT

NEW YORK, Sept. 8—A movement to interest Congress in adopting an amendment to the Dyer law which now makes it a felony to take a stolen car across a state line, has been started by the Nation Auto Anti-Theft Association. The proposed amendment would prohibit the export of any automobile, and forbid any steamship line to issue its bill of lading for the transport of any car, whether or not boxed, until its engine and factory numbers are certified by an inspector of customs as intact (and recorded); and further certified not to be on the list of stolen cars to be required to be kept posted in the office of the collector of customs of each port of entry in the United States.

STAR AGENTS IN BIRMINGHAM

BIRMINGHAM, Ala., Sept. 7—The Whitlock-McDonald Motor Co., Durant distributors for this territory, have been appointed factory representatives by the Star Motors, Inc., with full charge of marketing the Star line of cars in this territory.

Department Store Opens Free Garage for Customers

Waiting Rooms for Chauffeurs Are Among Facilities Offered

ST. LOUIS, Sept. 9—A garage to afford free parking space for customers for three hours with a charge of 50 cents an hour for overtime has been opened by the Scruggs-Vandervoort-Barney department store on St. Charles Street, near Eleventh, one block from the company's store.

The building is four stories high of reinforced concrete, fireproof, with sprinkler-protection. Ramps or inclined driveways connect the floors, no automobile elevators being used. This expedites entrance and exit. The ramps are 200 feet wide, so two-way traffic is easy on them. The slope of the ramps are so gradual no special driving expertness is required. They can be more easily negotiated than the usual entrance to a home garage. A special building design is employed to achieve this end. Each floor is divided into two levels, with parking areas staggered, so that the grade of the ramps between these levels is only one-half as steep as would otherwise be.

On each floor, waiting rooms for white and colored chauffeurs are provided. On the ground floor there is a display and a salesroom for automobile accessories and on each floor air and water is accessible. A waiting room for women is near the entrance. Cars driven by women are given first choice on the two lower floors

The building is designed for additional storage if need arises, the roof being built exactly as the floors. At the eastern end of the building there is a driveway into a large basement which contains the heating plant, the air compressor and pressure plant for the sprinkler equipment and space for employes machines.

The capacity of the four floors and roof is 500 machines.

MILLER BUILDING NEW RACER

LOS ANGELES, Sept. 11 — Harry Miller, veteran builder of racing cars, has announced he now has under construction at his plant here the first of two 122-cubic inch displacement engines which he expects to enter in the 1923 race at Indianapolis. The new engines will have eight cylinders all in line.

The chassis that will carry the Miller engines will be 104 in. in wheelbase, but will have a narrower frame and the body will be only 27-in. wide, accommodating a driver only. The bore of the cylinders will be 2 11/32 in., with a stroke of approximately 3½ in. Although the parts will be smaller, the engine will be similar in design to that which Jimmy Murphy has used in his car this season. The entire car will weigh about 1,400 lbs., and the power plant is expected to develop from 90 to 95 horsepower.

CONCERNING MEN YOU KNOW

Walter F. Wright, southern division manager of the Willys-Overland Co., has taken over the Cleveland branch of the Willys-Overland Co. and will operate it under his own name as a Willys-Overland distributor. The change took effect Sept. 1.

Roy Kramer has been appointed service manager of the Hayward-Peterson, Inc., Omaha, Nebr.

King Motor Co. announces the appointment of C. L. Graham as factory superintendent. Graham has been connected with the automotive industry for many years serving in a similar position with the General Motors Co. in Flint, for four years, and later going to Alma, Mich., as production manager of the Republic Truck Co.

A. W. Robbins, who for the past few years has been identified with the ball bearing industry because of his connections with the Standard Roller Bearing Co., and the Bearings Service Co., is now associated with the Bearings Co. of America, and will travel from its Detroit offices.

Ralph C. Chestnutt has been appointed chief engineer of the Templar Motors Co. of Cleveland, Ohio.

C. H. Burke has been appointed manager of the Redner Automobile Co., Milwaukee, Wisconsin distributor of the Peerless.

W. C. Allen, who has been in charge of the Chicago branch of the Black & Decker Mfg. Co. for the past year, has been appointed sales supervisor for the Black & Decker Mfg. Co. In order to release Allen for his new work, R. S. Mitten has been appointed branch manager for the Black & Decker Chicago territory.

Edward J. Tallant has been appointed salesmanager for Ford and Lincoln passenger cars, Ford trucks and Fordson tractors, by the Koelle-Greenwood Motor Co., Germantown, Philadelphia.

Cecil C. Robertson, for some time manager of the Savannah branch of the Blun-Dimmitt Co., and for the past two years general manager of the G. M. Robinson Motor Co., Jacksonville, Fla., has been appointed salesmanager of Joseph G. Blount, Georgia distributor of Chalmers and the Maxwell.

James Joyner has been named manager for the new branch opened recently in Atlanta by the Templar Motor Sales Co., of Cleveland. He advises that it is the company's plan to conduct an extensive sales campaign over the Southeast to line up dealer organizations for the Templar.

Earl Turner, who has been assistant secretary of the Automotive Electric Assn., was today made manager, this being one of the final acts of the four-day summer meeting of the association held at Old Orchard, Me., Sept. 1. The association offices are at 5363 Hamilton avenue, N. E., Cleveland, Ohio.

Herbert R. Hyman has been appointed advertising manager of the Stutz Motor Car Co. of America, now under control of Charles M. Schwab. Hyman comes from the Charles H. Fuller Co., the advertising agency which handles the Stutz account. Before that connection Hyman was a prominent executive of the Cole Motor Car Co. for many years. This most recent change brings him back to his old home, Indianapolis.

Truck and Bus Transportation Grows

CHICAGO, Sept. 8—Motor truck fleet owners and passenger bus operators in and around Chicago have experienced a decided spurt in business since the railroad shopmen's strike was called and it is thought by a majority of these men that the present high mark in their lines will not be abated by the return to work of the strikers.

Short hauls to neighboring towns via the motor truck have become quite the thing here and passenger busses have been busy all summer running into the resorts of Indiana. Preparations are now being made to continue this interurban service throughout the winter and more trucks are to be added within the next few weeks.

Merchants in Hammond, Gary, Miller and other towns in Indiana are now receiving and sending much of their goods by truck. Between Kankakee, Aurora, Batavia and towns in the Fox River Villey, a truck service has grown within two years from a single-man job to a corporation employing 50 people and 15 trucks. Garages are maintained by these people in Chicago, Aurora and Kankakee.

Fleet owners in Chicago, that is those who rent out their vehicles, say that although the year started out poorly, business has grown in leaps and bounds within the last month, until now practically every truck in their garages sees at least eight hours' service every day.

ST. LOUIS ELECTS NEW DIRECTORS

ST. LOUIS, Sept. 7—The board of directors of the St. Louis Automobile Dealers' Assn., at a meeting held recently elected two new directors to fill the vacancies caused by the resignations of Webster Colburn, formerly of the Dorris Motor Car Company and C. A. Cole, formerly of the F. C. Meyer Motor Co. G. W. D. Donnelly, president of the Supreme Motor Co., was elected to succeed Colburn, and Fred H. Squires, branch manager for The White Co., was elected to succeed Cole and represent the truck interest of the association.

The regular meetings and general activities of the association will be resumed in September. First of these activities will be a meeting of demonstrators and instructors who will hear lectures by representatives of the Safety Council including W. L. Patterson safety engineer on the proper method of teaching new owners of automobiles how to drive safely.

SOUTHEASTERN A. A. A. ELECT

BIRMINGHAM, Ala., Sept. 7—The Southeastern division of the American Automobile Association convened in Montgomery, Aug. 28 and 29. Gen. Paul B. Malone, assistant commandant of the United States Infantry School at Camp Benning, was elected president; Benjamin Russell of Alexander City, Ala., was selected as vice-president; Samuel B. Crosby, field department of the American Automobile Association, secretary; and H. G. Hastings, Atlanta, treasurer. Frank O. Miller of Jacksonville, Florida, and the newly elected officers will compose the executive committee.

DURANT'S FLINT PLANT

FLINT, Mich,, Sept. 9—The contract to build the new plant here for Durant Motors, Inc., has been awarded to the Christman Construction Co. This will be used for the manufacture of the Flint six-cylinder car. The plant will be along lines similar to that of the Lansing plant.

Believes Assembling Branches Would Be of Help in West

Cost Now Near $200 to Ship Truck; Could Be Reduced to $30

WASHINGTON, Sept. 8—A close study of the problems affecting manufacturers' distribution methods has convinced Gordon Lee, chief of the automotive division of the Department of Commerce, that it would be of an advantage to establish partial assemblage plants in the west. He believes that these plants could be operated at low maintenance cost and that savings in freights would be enormous.

Lee spent several weeks touring the far west talking with dealers and distributors. Many jobbers express the opinion that through partial assembly and packing in box car automobile trucks could be laid down for $30 whereas the present freight in many instances approximates $200. Lee believes that it will facilitate the export business with the Orient and allow brisk competition with European automobile manufacturers now cultivating the eastern markets. Lee was very emphatic in the declaration that the point of saturation has not been reached.

Talks with leading automobile jobbers and retailers convinces Lee that these men are honest in their belief that their profits in the future will come from better methods in eliminating careless wastes which they have permitted in their businesses in earlier days of their business career.

This Federal official also insists that developments are taking place in the west coast at such rapidity that these dealer organizations which are studying all phases and problems of their business are now to see in them the possibility of future sales expansion.

Lee made a study of the automotive industries through the west coast states by journeying via automobiles from San Diego to Seattle, with the exception of one short train journey. On this trip through the Yosemite Valley, he was accompanied by George Haberfield, president of the California Automotive Trades Association and R. W. Martland, secretary, as well as Byron L. Graves, manager of the Los Angeles branch of the Ford Motor Car Co. He addressed practically every dealers' association in three states, concluding his work with the Spokane Automobile Chamber of Commerce.

Lee called the attention of manufacturers to the fact that western jobbers and manufacturers of automotive equipment as the result of educational work being carried on in behalf of jobber and dealer by the Automotive Equipment Association, are now making an earnest attempt to follow out better business practices and eliminate wastes from methods pursued in the past.

BUSINESS NOTES

George Schroeder and J. E. Haverkampf have formed a partnership at Dundee, Ill., and will open a modern garage about Oct. 1, which is now nearing completion. The firm will specialize in repair and storage.

The Joliet, Ill., Tire and Rubber Co. has been organized and will manufacture solid tires for motor vehicles. The Ditto silo plant has been leased for a number of years and machinery is now being installed.

Bennett Motor Sales Co., of Litchfield, Ill., has been incorporated with capital of $10,000 to deal in automobiles and conduct a garage at 510 North State street. George W. Bennett, Frank E. Cox and Danville Bennett, all of Litchfield, are organizers.

The Elgin, Ill., dealers' used car exchange has been organized in that city with Nat Langellier as manager. A building has been leased at the corner of River and North streets. Nearly all of the motor car dealers of the city are identified with it and will turn over all their used cars to the exchange. Operation will be patterned after that of the Quincy, Ill., exchange.

Columbus United Tire Co., Columbus, Ohio, which has been operating two stores in Columbus and a chain in central Ohio, has opened a third store at 89 West Broad street, which is known as store No. 3. This makes the eighth store in the chain, others being located at Dayton, Portsmouth, Zanesville, Newark and Huntington, W. Va.

Following a recess of two months during the summer, the Atlanta (Ga.) Automobile Assn. will resume its regular meetings again the latter part of September, according to Lon Credele, president. Membership now includes approximately 90 per cent of all accessory and automobile dealers in Atlanta.

Beverly Automotive Co., 325 E. Twenty-first street, Chicago, has been appointed midwest distributor for the Tillotson Mfg. Co.

When the rail service began to fail them, the Commercial Appeal, a progressive newspaper of Memphis, Tenn., decided it was time to see that their papers reached their subscribers in spite of the strike, as a result they organized a bus line in the neighborhood of Brinkley and Clarendon, Arkansas, and now the papers are being delivered by bus instead of via the Cotton Belt.

The Southern Motor Co., Memphis, Tenn., distributors for the Cadillac car in this section, have moved into their new home on the corner of Monroe and Lauderdale streets.

C. A. Shaler Co., Waupun, Wis., manufacturer of tire repair tools, equipment, vulcanizers, etc., and headlight lenses, is now operating full time in its new factory, and to handle the overflow of orders is erecting a shop addition and an office building. The original plant was destroyed by fire in March and the industry has been entirely rebuilt at an investment of more than $350,000.

Latex Tire & Rubber Co., Fond du Lac, Wis., has decided to market a bond issue of $125,000 to provide capital for extension of production.

A Wisconsin charter has been granted to the Associate Motor Industries, Inc., a Delaware corporation, with principal offices at Dayton, O. A Milwaukee office has been opened at 230 Grand avenue, in charge of D. H. Davis. Of the $40,000,000 preferred and 800,000 common shares in the capital, it is stated in the application that $25,000 will be used in Wisconsin.

Federal Rubber Co., Cudahy, a suburb of Milwaukee, has started construction work on three additional floors of a new seven-story manufacturing addition, 120x250 ft., the foundations and first floor of which were erected last year. The structure is projected as a seven-story building, and the remaining three stories will be built early in 1923. It will represent an investment of about $400,000, including equipment. Arthur A. Frank is general manager and George J. Mead is chief plant layout engineer.

The Oldfield Tire Co., Akron, Ohio, which has opened a branch office and store in Milwaukee at 481 Jefferson street, has been granted a Wisconsin corporate charter. Of the $50,000 capital, $10,000 will be used in Wisconsin. G. A. Miller, local manager, is designated as agent.

Cropper-Kinney Auto Spring Co. has been incorporated at Lebanon, Ohio, a suburb of Cincinnati. The company is capitalized for $50,000 all common stock which has been subscribed for. George Cropper, president and treasurer, has been connected with the Milburn Wagon Co. on its sales force for the past 25 years and has a wide acquaintance among the trade in the middle west. L. H. Kinney, vice-president and general superintendent, had charge of the Studebaker spring factories for over 12 years.

The Standard Automobile Supply Co. has been chartered at Wooster, O., with a capital of $10,000, to deal in all kinds of supplies and accessories.

The H. W. Pfaus Reo Co., Wooster, Ohio, has been chartered with a capital of $20,000 to operate a sales agency and garage.

Upon the application of Benj. F. Hamey, president of the company, who claims he is surety on a note for $5,000, C. C. Pavey has been named receiver for the Hamey-Eich Co., at 200 East Gay street, Columbus, Ohio, central Ohio representatives for Dort cars.

Walter B. Zimmerman has purchased all of the stock of the Standard Motor Car Co., Columbus, O., central Ohio agents for the Hudson and Essex lines. The Standard Co. was established about a dozen years ago by the late Harry J. Schwartz. The purchase includes the lease on a storeroom at 15 to 25 North Fourth street, and also assignment of three 99-year leases on a large store building at Third and Chestnut streets. Zimmerman was formerly associated with his father and brother in the Dodge agency from which he has withdrawn. The Walter B. Zimmerman Co. has been chartered to take over the business and the Standard Co. has been dissolved. The territory includes a number of counties in central Ohio. The service station which was taken over entirely will be continued at Third and Chestnut streets.

John Nicol Co., 2210 Michigan avenue, Chicago, has become distributor for the Liberty and will continue to represent the Saxon Duplex.

A quarterly dividend of $1 a share on common stock has been declared by the directors of the Stromberg Carburetor Co. This is the first dividend since January, 1921, when 50 cents a share was paid. The $1 rate was in effect from July, 1919, to October, 1920.

Preparations are being made by the Sharp Sales and Service Co., Springfield, O., to open a sales room and maintenance station at 221 and 223 West Main street in the Poss building. The company will act as distributors for the Reo cars and Reo Speed Wagons in Clark, Champaign and Logan counties. Recently it was incorporated with a capital stock of $25,000, with C. F. Sharp as manager.

ENCLOSED CAR SHOW AT CLEVELAND

CLEVELAND, Sept. 7—The Cleveland Automobile Manufacturers & Dealers' Assn. has contracted for the central section of the exhibition hall in Cleveland's new municipal auditorium for a display of enclosed cars during the merchants and manufacturers' exposition which will be held Sept. 18 to 28. Retail merchants and manufacturers are staging an ambitious fall exposition and style display just prior to the fall season and this has been deemed an opportune time for a concentrated display of enclosed cars instead of individual displays, therefore the automobile trade organization as a whole contracted for a block of 15,000 sq. ft. which would permit of showing one enclosed car from each line represented in the assoication. The exhibit will then be uniform and impressive. The details are being handled by Herbert Buckman, manager of the association.

MEMPHIS INDUSTRIAL SHOW

MEMPHIS, Sept. 9—The Ford Motor Co., Memphis Branch, co-operating with the 230 dealers of this territory, will conduct an Agricultural and Industrial Exposition in connection with the Tri-State Fair September 23d to 30th, inclusive.

Lincoln, Neb., Dealers See No Let-Up in Sales

Many Establishments Seek to Enlarge Their Present Quarters

LINCOLN, Neb., Sept. 7—There is no let-up in the automotive business here, and at this time nearly every dealer in Lincoln is looking for new and larger quarters, or figuring on how to enlarge present quarters.

C. C. Quiggle, secretary and treasurer of the Patriot Mfg. Company, manufacturers of the Patriot truck, reports a steady demand for trucks and commercial bodies.

F. R. Hussong, who entered the automobile business in Lincoln in 1917, as a Ford agent, says his first contract made with the Ford Motor Co. called for the annual delivery of 165 cars. He now receives 1,000 a year and is always behind on orders.

J. H. Markel, Dodge dealer, was forced to remodel an old building for Dodge business in this territory, and at this time the Dodge car is at home at the corner of 12th & Q streets. The remodeled building is the old Nebraska Aircraft building. The service shop in connection with the sales department is being equipped with automatic machinery for cutting down the time on repair and overhauling work.

The O'Shea Rogers Motor Company has done a business of 300 per cent above the estimate with the Ford Motor Company since they started in their business a year ago. The estimate of 25 cars a month has been far too small for this company. Instead of 25 cars a month, this company has delivered an average of 100 Ford cars every month.

Halbert & Locke, Dodge and Chevrolet dealers, at 1836 O street, maintain a staff of expert mechanics who have worked on these cars since they were put on the market. They were formerly located at 1931 O street, but due to inadequate room and working facilities, they were forced last month to find larger quarters.

The distribution of Paige and Jewett cars was taken over in April by Will F. Hitchcock at 1724-1726 O street, and since that time he has averaged five deliveries each week.

The tire business is going strong in Lincoln and several of the tire shops have been forced to seek larger quarters for their business.

CHICAGO ASSOCIATION LEGAL DEPARTMENT

CHICAGO, Sept. 8—The Chicago Automobile Trade Assn. has installed a legal department, the services of which are free to all members. An attorney is on duty at the association headquarters and gives advice on urgent questions by telephone.

The Readers' Clearing House

Questions & Answers on Dealers' Problems

When Should Crankcase Oil Be Rejected?

Q—On present low grade of fuel, give practical shop method for determining approximately dilution of crankcase oil. Is it safe to continue operation of motor when oil is 40 per cent diluted?

1—The accurate method to determine the percentage of dilution of oil is by means of a viscosimeter. This is a laboratory instrument and comparatively expensive. There has been recently placed on the market a small hydrometer known as the Larclif Dilut-O-Meter. Although this meter supposedly determines when the oil should be condemned as being too thin, we do not believe its accuracy can be depended on except for comparative readings. As a comparative reading is all that is required by the average garage, we believe that it should be of great value to you in determining whether or not diluted oil should be condemned or used over again.

Its application used to secure comparative readings should be something like the following: Suppose that an engine whose recommended lubricant was a light oil has been brought into the shop with the oil very much diluted. By placing the Dilut-O-Meter in a sample of this oil and noting the reading on the neck of the instrument, then placing the instrument in a vessel containing light oil of average viscosity which has not been used will determine the percentage of dilution.

2—Is the successful apparatus for automatically refining crankcase oil already on the market? If so, where?—Harry Landeweir, Cleveland, Ohio.

2—We have been informed by Mr. A. L. Gross, 2010 Peoples Gas Bldg., Chicago, that they are at the present time just getting into production on the Gross continuous system of oil regeneration. We would advise that you communicate with Mr. Gross for further information regarding prices and other details.

USE PROCESS OF ELIMINATION TO DETERMINE CAUSE OF SEIZURE

Q—We have a Chevrolet 490 which does not crank, Pistons seem to be free as we have poured kerosene in cylinders and let it stand 12 hours and kerosene disappeared, still engine could not be turned. Owner says car has not been run for four month but ran well the last it was run. There is plenty of oil in crankcase but owner does not want motor taken down unless we can tell him the trouble before it is torn down. We cannot see anything wrong with transmission. Would it be possible that the bearings could dry out in four months so as to stick and make it impossible to crank motor? — Riley Garage, Riley, Ohio.

1—Regardless of whether the owner wants engine taken down or not we believe that the best method to determine what is causing the friction is to disconnect all connecting rod bearings and then note whether the crankshaft can be turned. If the crankshaft can be turned, it is certain that the piston rings have rusted to the cylinder walls.

Although the kerosene will find its way past the rings it does not of necessity mean that the pistons are free. If the pistons are stuck by rust it will be necessary to remove the pistons so we do not see why the owner should object to having the connecting rod bearings disconnected in order to find out the exact cause of the friction.

UNEVEN COMPRESSION A PROBABLE CAUSE OF ERRATIC IDLING

Q—We have just finished overhauling a Franklin engine, 9B, in which we installed DeLux pistons, Gill rings, Kill-Knock bearing nuts on the rods, ground valves, cleaned carbon and put in new points. We also checked up the ignition and sent carbureter to Franklin Company to be overhauled. Upon assembling this engine and running it 1,500 miles we find it has never fired regularly while idling. Number 1 and number 6 cylinders are the only two that fire steadily while idling.

We checked over all manifold gaskets and put in new ones, also placed washers under valve springs to increase tension. Still it will not hit on all six steadily while idling. If the throttle is opened up wide suddenly, it hits on all as it picks up, but when it reaches a steady speed, slow or fast idling, it misses on number two, three, four and five. When pulling up grade or up hill this engine seems to be hitting every one steadily and still it has not the power it originally had before these changes were made. What can be the trouble and the remedy for it?—R. F. Sefzik, Dubuque, Iowa.

The probable cause of the erratic action of this engine could be traced to air leaks around the valve stem guides. Would suggest that you remove the valve springs and valve spring retaining keys and note the amount of wear between valve stem and valve guide. This clearance should not exceed .010, if greater it will affect the idling performance of the engine. You do not state whether the compression is even on all cylinders and we would suggest that you also check up on this, if possible secure a compression meter and using the same throttle opening on all cylinders and the same crank speed, note whether there is a variation in the pressure reading on the gage. A variation of more than 15 pounds will be sufficient cause to produce missing at idling speeds.

The loss of power may be due to the installing of cast iron pistons, as this engine was originally equipped with aluminum pistons. In regard to checking up the ignition, it would be well to recheck the interrupter points and the setting off of the spark plugs. The gap between contact points on the open-circuit Atwater-Kent should be .010 of an inch and the timing should be so adjusted that the click will occur when the flywheel is 1½ in. ahead of the center line on one and six cylinders, with number one cylinder on firing stroke.

LOOK TO RADIATOR AS CAUSE OF OVERHEATING

Q—I have a Hudson car 6-40—1915 model. The engine heats very badly and water will boil soon after engine is started. Engine pulls well when cool, have had new timing gears and new pump put on the engine but does no good, also new jets in carbureter.—C. B. Eads, Box 54, Holly Springs, Miss.

There are many possible causes for overheating and although your information as to symptoms is far from complete we are inclined to suspect the radiator. We would advise that you first determine if the water is being circulated throughout the system by the pump. If a very distinct surge or tendency to expand is present when the top radiator hose is squeezed, while accelerating the engine, it is indicative that the circulation is not totally cut off. Examine all hose connections for obstructions. These can be detected only by the removal of the hose and a careful examination of the interior wall of same.

The reason for suspicion being cast on the radiator is because of the age of the car, a radiator which has been used seven years in a community where lime or alkali is common can not be expected to cool properly. We would also suggest that the timing of the valves and magneto be checked. If overheating was not noticeable previous to installation of new timing gears there is great probability that incorrect timing is the cause of overheating.

The Readers' Clearing House

THIS department is conducted to assist dealers and maintenance station executives in the solution of their problems.

In addressing this department, readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been made and these are answered by reference to previous issues.

Inquiries not of general interest will be answered by personal letter only. Emergency questions will be replied to by letter or telegram.

Address of business firms will not be published in this department, but will be supplied by letter.

Technical questions answered by B. M. Ikert, P. L. Dumas and A. H. Packer; Legal, by Wellington Gustin; Paint, by G. King Franklin; Architectural, by Tom Wilder; Tires, by a Practical Tire Man; General Business questions, by MOTOR AGE organization in conference.

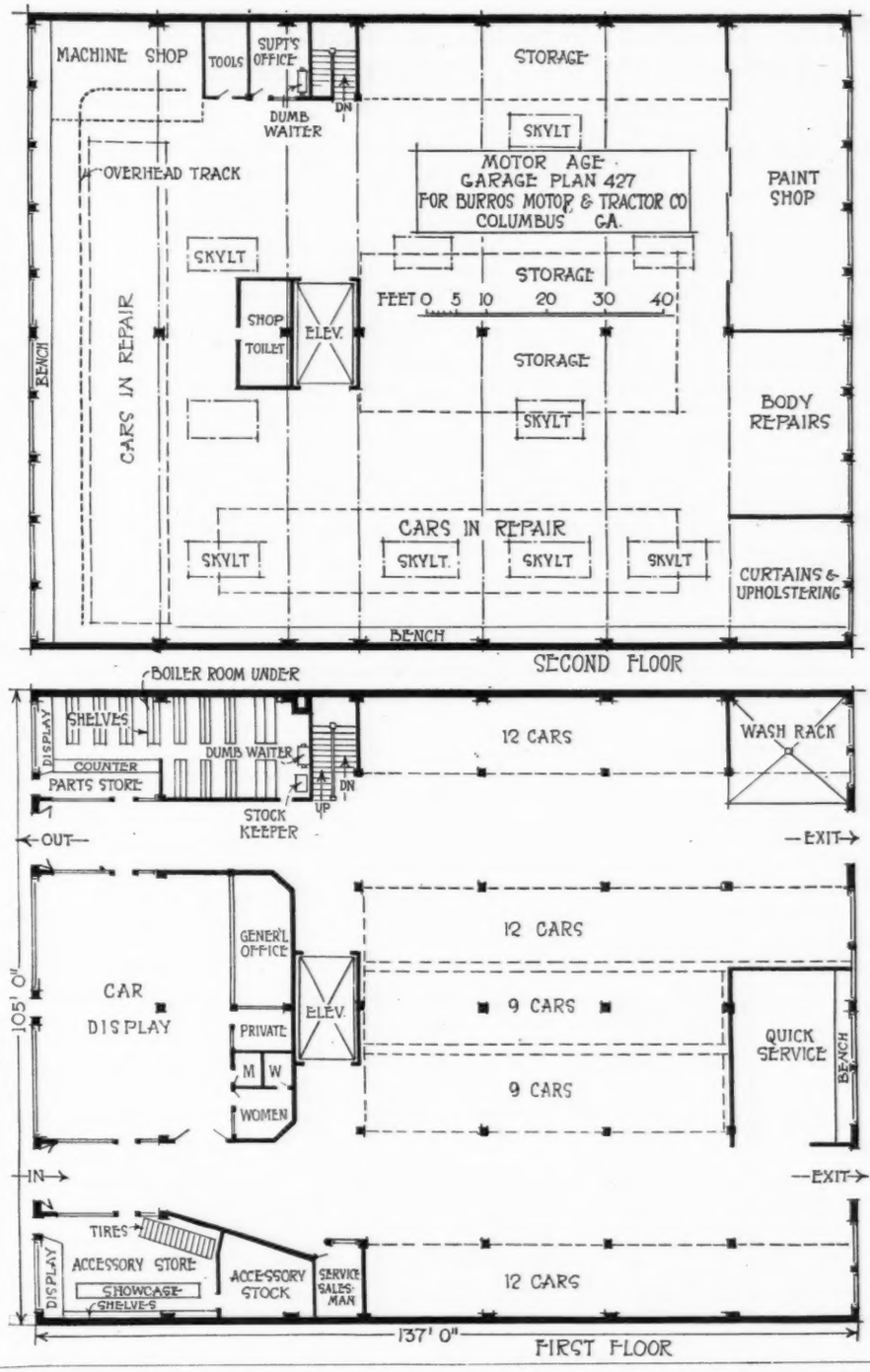
A Complete Ford Sales Building

Q—We are contemplating the erection of a new service station and would like to ask you for suggestion as to the arrangement. We will build on a lot 105 ft. front by 137 ft. back. This will be a two-story building and it is our idea to have showroom, offices, stockroom and service garage on the first floor. On the second floor we will have shop and painting department. We sell around 500 cars a year and will appreciate any suggestions you have to offer.—Burrus Motor & Tractor Co., Columbus, Ga.

This layout we believe, should work out very nicely. There is no waste space and the whole scheme is symmetrical and consistent. There are two exits at the rear but they may be dispensed with. There should be a cross over aisle but when the garage is full and the space is needed the rear exits would come in handy.

The office space is the only one that possibly is undersized and it could encroach on the display room or the elevator could be moved back and part of the space used for office and part for cars. It will be noted that the elevator is in a narrow bay between two columns 12 ft. on centers while the others are 20 ft. 6 in. on centers. This is done to make the space right for car storage but since there is no car shortage in the front part it would probably be best to divide the space into 3 equal bays in case the elevator is moved back.

Heating plant would be located under the parts department with coal bin under sidewalk in front or under aisle with coal holes in the floor of the aisle.



Architectural Service

IN giving architectural advice, MOTOR AGE aims to assist its readers in their problems of planning, building and equipping, maintenance stations, garages, dealers' establishments, shops, filling stations, and, in fact, any building necessay to automotive activity.

When making request for assistance, please see that we have all the data necessary to an intelligent handling of the job. Among other things, we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

CAUSE AND PREVENTION OF CRACKED CAR PAINT

Q—What causes the paint on a car to check, and is there any way to prevent it? If so, what is it?

1—Paint coats will crack because of their drying out—because of faults in the materials themselves—and because of poor workmanship.

Their drying out can be prevented by the auto owner if he will keep them under an elastic coat of finishing varnish. When fine cracks develop in the finishing coat, or when it dries out and loses its luster, the surface is in need of another protective coat of varnish. If these cracks are allowed to spread and penetrate the undercoats the paint film loses its serviceability. If cracking develops because of faulty materials or workmanship (this happens in a comparatively short time after the job is put in service) the condition must be corrected by the auto painter.

2—Would you advise the use of a polish on a new car, or one newly painted? If so, and the answer would not be in violation of the policy of your magazine, what polish is preferable?

2—Any polish which does not leave a residual film on the surface, like wax, is useful for removoing spots like finger marks from a varnished surface. Such polishes are applied for cleaning purposes only and then entirely wiped off. Polishes which restore luster to a surface temporarily by depositing a film of oil or wax are of temporary benefit but the effect is not permanent. Their film is a source of great trouble to the auto painter when he is called upon to repaint a car on which they have been used. When the luster of a surface is gone the surface should be rubbed and revarnished.

3—After the paint on a car has become dull, is there any way in which the same may be restored without the use of a finishing varnish?

3—There is no substitute for finishing varnish. Polishes are of temporary benefit only. Revarnishing is the correct procedure, providing, of course, the undercoats are in good conditions.

4—How may road tar be removed from the body without injury to the paint?

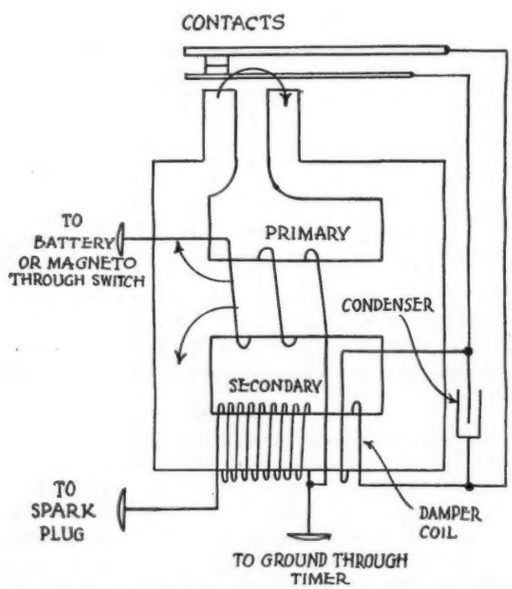
4—There is a preparation to be had for this purpose. The name and address of the maker were supplied by letter.

The Damper Winding Principle As Applied to Varley Transformer Coils and Some Starting Motors

In the July 6 issue of MOTOR AGE there appeared a description of a new type of transformer coil to be used in place of the regular vibrator coil and in this new type there was employed a rather novel principle. It was accordingly, somewhat of a surprise that no inquiries were recieved as to the exact method in which this device operates, as its principle is entirely different from that of any other ignition device now being used.

The production of a high voltage spark is possible by a very rapid change of magnetism occurring through a coil having thousandths of turns of wire, such a coil usually being known as a secondary winding. In battery ignition systems, for example, a core of iron is magnetized by a battery and another winding known as the primary, but the voltage generated in each turn of wire at the time of closing the circuit causes the magnetism to build up so slowly that no appreciable voltage is obtained when the circuit is made. It has accordingly been accepted as a recognized principle that ignition devices should ordinarily not be based to operate when the primary circuit was closed. On breaking the circuit, however, with a condensor used at the break to absorb the arc and cause a sudden stopping of the current, the conditions are different. The sudden dying of the magnetism under these circumstances causes such a violent charge in magnet conditions that a very high voltage is produced in the secondary winding and a spark thereby secured.

A simple illustration of the action of a damper winding or damper coil is shown in Figure 1. Here we have no particular design as there is no ignition feature desired, but the sketch is merely to illustrate the action of a damper coil. On closing the switch the current flows from positive battery through the upper coil as indicated by the arrows, which produces a magnetic condition in which the top of the iron core is a north pole and the bottom is a south pole.

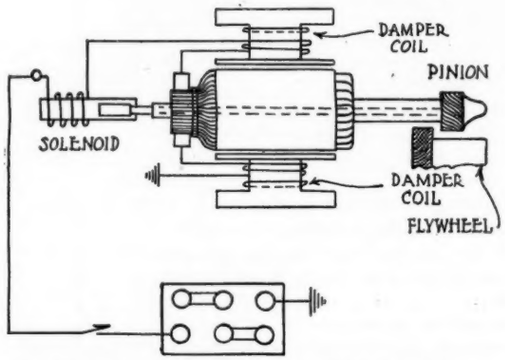


DAMPER COIL IS BASIS OF VARLEY FORD TRANSFORMER COIL
* 100780

Fig. 1

There is a general electrical law to the effect that changing magnetism produces a voltage in any coil through which it changes. Accordingly, in the damper coil shown below there will be a voltage produced and as the coil is connected to itself there will also be a current flowing.

There is another simple electrical law to the effect that any current so produced is always in such a direction as to have an opposing magnetic effect. Consequently, the current in the damper coil has a demagnetizing action, while the current in the upper coil is producing a magnetizing action. This means that the effect of the upper coil will be neutralized so that the magnetism rises comparatively slowly. For this reason it is possible to take an ignition coil which is working fairly well, wind a lot of copper wire around it and connect the two ends together thereby making the sparks miss occasionaly, showing that current induced in the damper coil, has a detrimental action.



DAMPER COILS ON FIELD POLES REDUCE CLASHING OF STARTER GEARS. * 100779

Fig. 2

While in ignition the damper current is usually considered detrimental this effect has been used to advantage in some types of starting motors, one made by the Westinghouse company being shown in Figure 2. In this particular type of mortor the starting current flows through a solenoid and through the fields and armature of the machine. Its action in flowing through a solenoid is to draw a spiral pinion into mesh with a spiral gear attached to the flywheel. Under ordinary circumstances, however, the action was so sudden that the teeth were sometimes injured and the starting motor would begin to rotate before the teeth were fully in mesh.

A change in the design, however, which incorporated a damper coil which was merely copper strap short circuited on itself improved the condition considerably. The first rush of current through the starting motor produced a condition of magnetism, thereby sending a heavy current through the damper coil. This had a temporary retarding action so that the pinion had a chance to get into mesh with the flywheel gears before excessive torque was exerted by the starting motor armature.

Reverting again to the question of ignition design, we find that the Varley transformer coil, by a peculiar use of a damper coil, obtains its secondary spark when the magnetism builds up. The operation is indicated by the sketch, Figure 3. The circuits are the same as on any Ford coil, being from the upper terminal at the side to the primary and to the lower terminal which connects to the timer. In this case, however, there is no vibrator in series with the primary. As the timer makes contact, the first rush of current through the primary winding will produce a condition of magnetism in the center portion of the iron framework.

There will then be two magnetic paths as indicated by the arrows, one being from the central portion of the frame down to the left through the secondary winding, and up to the central portion again. The other magnetic path is from the center portion at the lower contact armature as indicated by the arrow and back to the central portion of the frame again. Under ordinary circumstances we would say that on account of the air gap in the upper circuit that practically all of the magnetism would go around the lower path and hardly any at the upper path.

The first rush of magnetism does go by the lower path but immediately generates an induced current in the damper coil, the circuit of which is completed by the contacts at the top of the sketch which are normally closed. This induced current in the upper coil has such an opposing effect that the

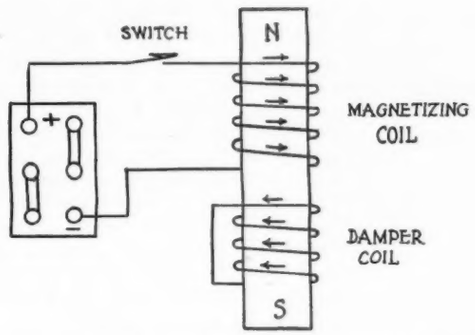


Fig. 3

magnetism produced is forced out of the lower path and compelled to go across the upper air gap and through the armature which holds the lower contact. This, of course, results in a small fraction of a second in drawing the contact apart. Opening of the contact immediately kills the effect of the damper coil so that the magnetism is now able to come with a rush down through the lower part of the frame which carries it through the secondary winding.

This sudden rush of magnetism generates high enough voltage to produce a spark at the spark plug so that by this ingenuius use of the damper coil and contacts a spark is obtained by the magnetism building up through the secondary instead of dying out. A complete iron circuit is univerally recognized as being more efficient than one in which there is considerable air gap and it is doubtless on this principle that the design is based which, it is said, makes possible a much hotter spark than could be obtained with a coil of the regulation type.

POINTERS ON TROUBLE SHOOTING

Q—Give us a few pointers on trouble shooting on the 12-volt Dyneto electrical system used on a few Ford cars of early model.—Wm. Dowling, Covington, Ky.

A wiring diagram of the Dyneto motor generator in question, together with battery, ammeter and ignition switch, is shown below. This type of motor generator did not use a cutout, but instead, the operation of the ignition switch served to connect up the shunt field of the machine and also connect the machine to the battery. It will be seen from the diagram that negative battery is already connected through the series field of the machine to one of the main brushes.

When the ignition switch is turned on another contact in the switch connects the top brush through the switch to the ammeter so that discharge current will go through the meter. Then when the engine starts the machine will start to act as a generator and will send current the other way through the meter as charging current to the battery. The operation of the ignition switch which connects the two large terminals also connects the number 3 end of the shunt field to the heavy cable which comes from number 2.

In trouble shooting on this type of electrical system it would be well first to try the outfit as a starter as, if it will not start the engine, it is quite likely that the battery is low or that the brushes make poor contact with the commutator. It is also possible that the battery terminals are corroded, which would be noticed by the lights going out when the ignition switch is turned on. If the starting feature is in good condition but the machine will not generate, it is possible that the third brush is not making good contact with the commutator or that the field connection inside of the ignition switch is not made.

To check this condition it would be possible to temporarily disconnect the wire on the number 3 terminal and then flash it to this terminal when the ignition switch is turned on and the starter is cranking the engine. If no spark occurs the circuit is open. A wire can now be temporarily connected from the armature to the shunt field terminal on back of the ignition switch to see if this corrects the trouble. If it does so, the switch is at fault, otherwise the open circuit is doubtless in the field winding of the motor generator. It should be remembered in working on a system of this kind that an ordinary ammeter will not be satisfactory, as it will burn out in carrying the starter current. Special meters, however, are obtainable which can be used without harm for starter current and will also register the generating current.

BOSCH DUAL MAGNETO CIRCUITS

Q—Publish again wiring diagram showing the external circuits of the Bosch duel magneto system, also the internal circuits of the same system, as formerly shown on page 28 of the April 23, 1914, issue.—A Reader, Los Angeles, Calif.

1—Diagrams requested are shown herewith.

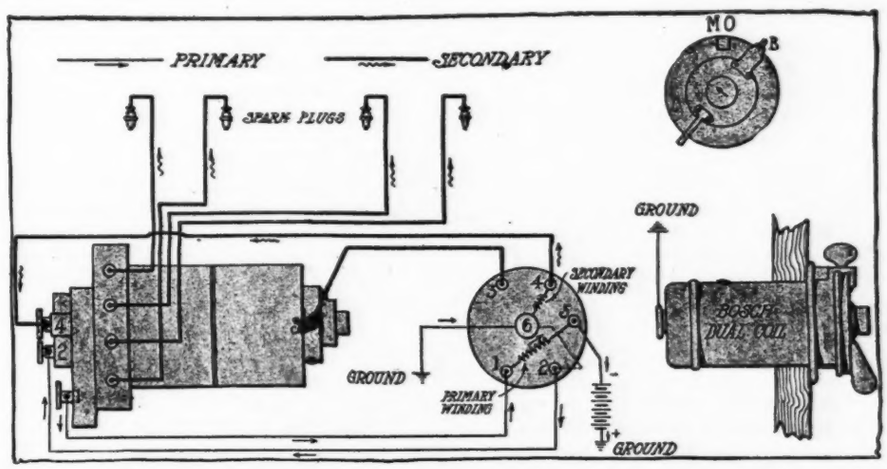
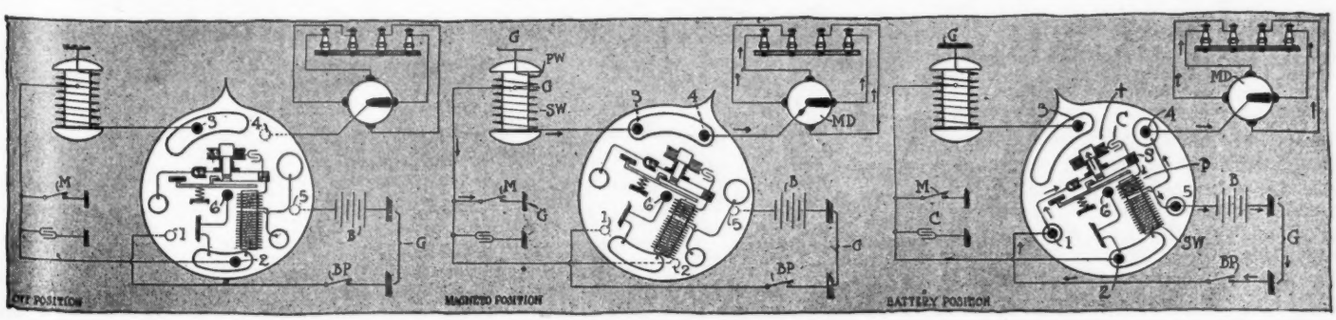
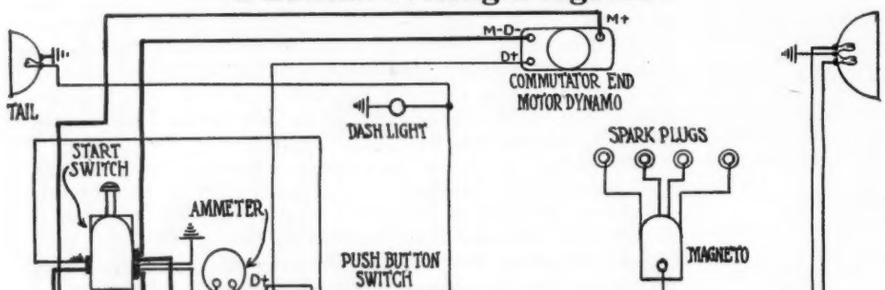


FIG. 6—OUTSIDE WIRING DIAGRAM OF THE BOSCH DUAL SYSTEM
Here the switch is on battery side, thus opening the magneto circuit made by 3 and 4



Internal circuit diagram of Bosch Dual Magneto System

Pullman Wiring Diagram



Q—Publish wiring diagram of 1916 Pullman.—W. L. Ives Machine Co., Sturgeon Bay, Wis.

1—Diagram requested is shown in above.

AIR DISPLACEMENT OF TIRES

Q—Give the cubic inch air displacement of the following tires: 30x3 clincher fabric, 30x3½ clincher fabric, 31x4 clincher fabric, 32x4 straight side fabric, 33x4 straight side fabric, 34x4 s. s. fabric, 34x4½ s .s. fabric, 30x3½ clincher cord, 31x4 straight side cord, 32x4 s. s. cord, 33x4 s. s. cord, 34x4 s. s. cord, 34x4½ s s. cord.—Gimick Tire Inflator Co., Philadelphia, Pa.

The following information has been supplied us through the kindness of the Goodyear Tire & Rubber Co., the pressures given pertaining to the volumes of the tires manufactured by the Goodyear Company:

		Cu. In.
30x3	Clincher Fabric	400
30x3½	Clincher Fabric	497
31x4	Clincher Fabric	668
32x4	Straight Side Fabric	753
33x4	Straight Side Fabric	839
34x4	Straight Side Fabric	850
34x4½	Straight Side Fabric	1004
30x3½	Clincher Cord	754
31x4	Straight Side Cord	818
32x4	Straight Side Cord	887
33x4	Straight Side Cord	930
34x4	Straight Side Cord	1029
34x4½	Straight Side Cord	1207

The volume in cubic inches of the tires of various tire manufacturers will show some variation from this table, although it is believed they would not vary either above or below these figures more than 10 per cent.

DIAGRAM OF ELECTRICAL SHIFTING DEVICE ON 1914 CADILLAC

Q—We have a 1914 Cadillac and would like to have diagram showing operation of the electrical shifting device of the two-speed axle.—Star Garage, Dallas, Tex.

1—We have shown below two cuts, one of which gives the view of the magnetic latch assembly to which reference will be made in connection with adjustment. The other cut shows a cross section through the axle illustrating the manner in which the change in gear ratio is made. It will be noticed that there are two bevel ring gears and two pinions, each pair always being in mesh. The two pinions, however, are integral with sleeves which are not directly connected with the propeller shaft.

The connection to the propeller shaft is made by means of a sleeve which is marked No. 2 which can be either meshed with No. 1 or No. 3, depending on movement of the rod N. Sleeve No. 2 is driven by the propeller shaft so that when in mesh with No. 1 will give the lowest speed in the axle, and then moved the other way so as to mesh with No. 3 will drive the larger pinion giving greater speed to the bevel pinion and consequently higher car speed for the same engine speed.

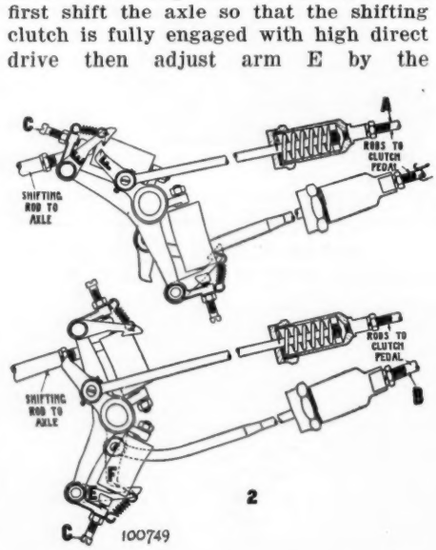
Referring now to the cut which shows the adjustment of the magnetic latches, we come to the question of adjustment. Before this is done, however, it is necessary to adjust the clutch pedal so that there is one inch movement before the clutch releases. To adjust the magnetic latch controlling the low direct drive, first shift the axle so that the shifting clutch is fully engaged with high direct drive then adjust arm E by the screw C until the points indicated by arrows on arms E and F just pass each other when clutch pedal is pushed forward with the gear shifting switch in the neutral position.

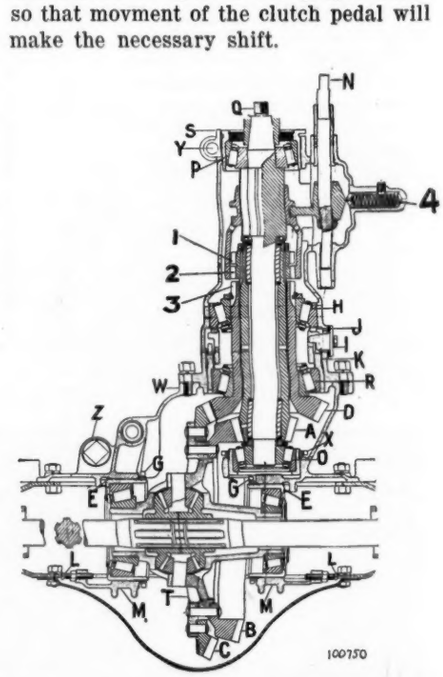
To adjust the magnetic latch controlling high drive, first shift the axle so that the shifting clutch is fully engaged in the low direct drive. Then adjust the arm E by the screw C till the points indicated by arrows on arms E and F just pass each other when the clutch pedal is disengaged with the gear-shifting switch in neutral position.

To adjust rod A have the shifting clutch in the axle fully engaged in the high direct position. Then adjust the length of rod A until the distance between latch point is ⅝ of an inch. When making this adjustment be sure that the clutch pedal is held back properly by the spring provided for that purpose.

To adjust the rod B make sure that the shifting clutch in the axle is fully engaged in the low direct position. Then adjust the rod B until the distance between the points of the latch is ⅝ of an inch. As in adjusting rod A, make sure that the clutch pedal is held back properly by the spring provided for that purpose.

While the wiring of the car is somewhat complicated, that position of it relating to the rear axle is fairly simple. Briefly, it comprises a wire coming from the battery or a connection thereto to a central terminal of the shifting switch. Turning this switch one way or the other merely makes a connection from central terminal to either of the magnetic coils which operate the magnetic latches. The other end of each one of these coils is grounded. The electrical operation is therefore merely selective and serves to operate the proper latch so that movment of the clutch pedal will make the necessary shift.





Units of two speed axle device used on 1914 Cadillac. Upper left—Latch solenoid mechanism controlling axle shift for low direct drive. Lower left—Latch mechanism and points of adjustment for high direct drive. Right—Section through differential and axle showing double pinion and ring gear installation

VARIETY OF QUESTIONS

Q—Give power curve of the Templar engine, 3⅜ by 5½.

1—The power curve of this engine is not available but we are informed by the local Templar agency that the engine develops 50 hp. at approximately 2,500 r.p.m.

2—Publish power curve of the Ansted engine, 3¼ by 4½.

2—Power curve of this engine is shown in Fig. 3.

3—Publish power curve of the Continental 7R engine, 3¼ by 4½.

3—Power of this engine is shown in Fig. 4.

4—Publish power curve of the Paige, 3¼ by 5.

4—Power curve of this engine is shown ing Fig. 1.

5—Publish power curve of the Velie, 3⅛ by 4¼, model 58.

5—Hp. curve on this engine is not available, although it delivers approximately 53 hp. at 2,600 r.p.m.

6—Publish power curve of the Oakland 34B engine, 2 13/16 by 4¾.

6—Curve of this engine is shown in Fig. 2.

7—Give maximum power developed by these engines.

7—The maximum power is indicated on the power curve chart.

8—Give weight of the following five-seated cars: Packard single six, Templar, Velie model 58, Lexington model U, Paige 6-44.—G. L. Winger, Epsom, Auckland, New Zealand.

8—Packard Single Six, 3,150 pounds; Templar, 2,750 pounds; Velie model 58, 2,650 pounds; Lexington model U, approximately 3,100 pounds; Paige 6-44, 3,090 pounds.

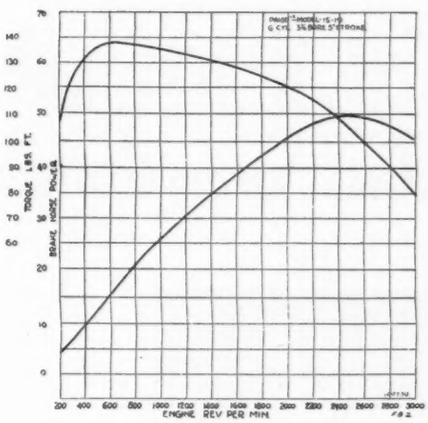


Fig. 1
Paige six 3¼ x 5"

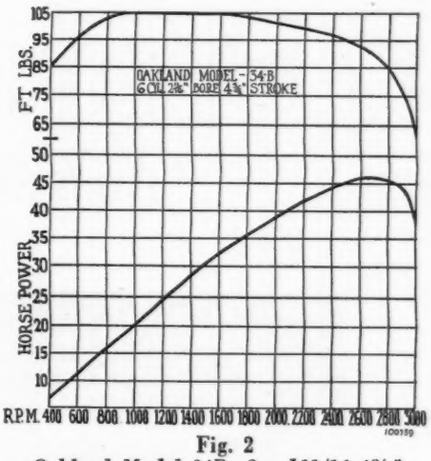


Fig. 2
Oakland Model 34B—2 and 11/16x4¾"

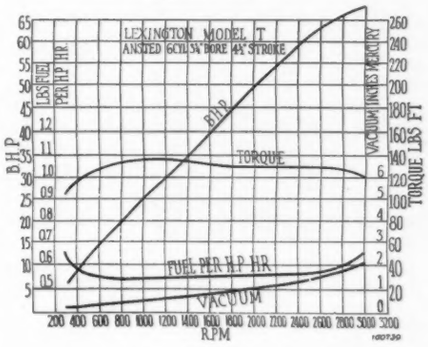


Fig. 3
Lexington-Ansted engine 3¼x4½"

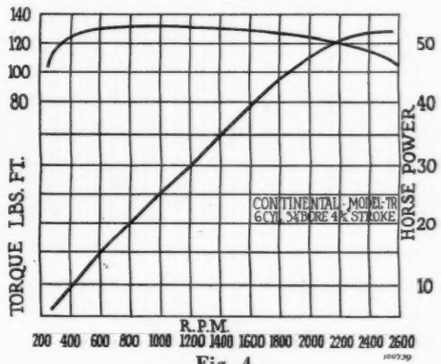


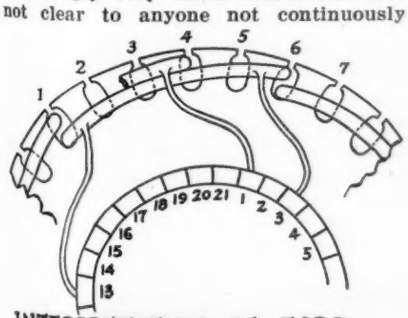
Fig. 4
Continental 7R—3¼x4½"

Power characteristics for four well known engines

POINTS ON ARMATURE WINDING

Q—On page 39 of the March 30th issue of MOTOR AGE there was an article and diagram on the method of winding a Ford generator armature. Among the notes at the side of the diagram was the following: Remarks—Number one slot is the bottom of coil, number one seg at the top of coil. We would like an explanation in regard to this note. Are not all of the coils wound one over the other without any regard to the throw of coil? Is there any attempt made to have each coil of equal length and equal resistance? What is the style of winding called? Is this not a loop winding or wave connected winding?—Martin Salazer, Santa Fe, New Mexico.

The diagram in question which was published in the March 30th issue of MOTOR AGE was taken from a book of wiring diagrams compiled by an armature winding shop and the notations are accordingly very much abbreviated and not clear to anyone not continuously working on jobs of this kind. In the cut shown in Fig. 5 we have indicated a sketch which gives our idea of the meaning of the remarks given in connection with the former armature diagram. Contrary to your opinion, you will find that armatures are very systematically wound and the coils are all similar.



INTERPRETATION OF FORD ARMATURE DIAGRAM SHOWN IN MAR. 30TH ISSUE

Fig. 5

This means that the various coils lap above and under each other very much as shingles do on a roof, except that on the armature they continue around and there is no particular point that could be considered the start or the finish of the winding. Our interpretation of the remark is that the lead which goes from bar No. 13 to the number one slot goes to the side of a coil which is at the bottom of the slot. The armature coils should be all alike and should have the same number of turns, the same length of wire and the same resistance.

This type of winding is known as a wave winding because it keeps on going and does not return to an adjacent bar until it has gone all the way around the commutator. The winding as shown in the March 30th issue would go from bar 13 through slot number 1 and 6 to bar 3 and at the next jump would continue in the same direction through two more slots and would then come back to a bar which is next to No. 13. If the winding comes back to bar 14 it is called a progressive winding and if it comes back to bar 12 it is called retrogressive, because as the winding is traced in one direction it keeps stepping.

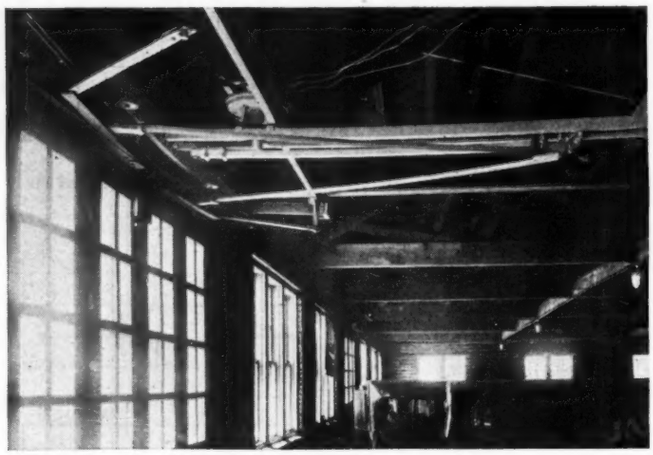
A CHEVROLET THAT OVERHEATS

Q—Having trouble with a Chevrolet 490 overheating and with the clutch slipping. I read the article in MOTOR AGE of July 20 regarding the raising of the oil troughs 5/16 of an inch and I have taken off the case and filled the troughs with hard oil then bolted on the case and turned the engine over, but when I took the case off there was no indication of the connecting rods striking the hard oil. I raised the troughs 5/16 in. After that it showed some inclination to smoke, but not noticeable, on the road, and it did not use a quart of oil in 150 miles. But this did not stop the overheating entirely, although it helped some. I put on a new radiator and the water circulation is fine, spark is properly timed, carbureter seems to be in good condition. If you or anybody else can tell me what will stop the 490 from overheating, will be truly grateful.—C. L. Wilson, Gillette, Wyo.

1—The question that first arises is concerning the radiator. It is possible that the radiator you installed is not a genuine Chevrolet radiator and there are many replacement radiators which do not possess suffcient cooling capacity to properly take care of the Chevrolet engine. If you have installed a Chevrolet radiator, another possibility is that the valves are not timed correctly and we would suggest that you carefully check up on the valve timing and also use heavier lubricating oil. If you will carefully read all the answers pertaining to Chevrolet overheating that have appeared in MOTOR AGE during the past few months, we believe that you will find that one of the many remedies suggested will fit your case.

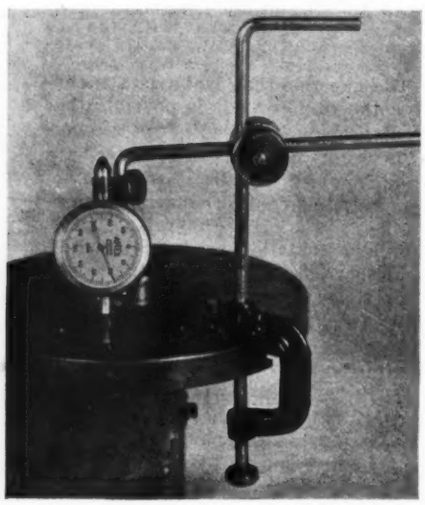
SERVICE EQUIPMENT

Aids for Time Saving & Accuracy



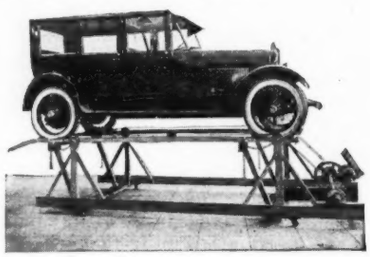
AMES JUNIOR UNIVERSAL ATTACHMENT

This is a device to go with the Ames Junior Dial Cylinder Gage outfit, or it can be used separately. It clamps into any position and permits gaging at any scale, being so designed that it will clamp any object that will go between the jaws of the clamp. It shows the straightness of shafts, crankshafts, camshafts and valve tems. It will also check the lift of valve cams. On piston rings it can be used to show their thickness and in fact, thickness of all materials like shims, and bearing liners. Other uses include gaging the diameters of pistons, trueness of flywheels, gear box shafts and angles. The price of the attachment is $5. B. C. Ames Co., Waltham, Mass.



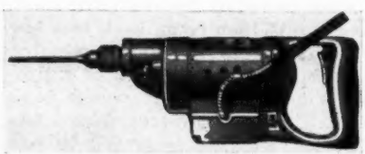
DAVIS AUTO LIFTING DEVICE

The Davis Auto Lifting Device consists of two U-shaped steel runways upon which the car is run, and by a gear and pulley arrangement is easily raised to a height of four feet or less by turning a crank. Davis Auto Lifting Co., 500 Auzerais ave., San Jose, Cal.



CLARK AUTOMATIC DRILL

The housing of this drill is made of aluminum alloy. The spindle is of steel, heat treated, turned and ground. The gear arrangement gives the proper spindle speed for the size drill bit used. An offset sprindle permits work in close places. Fifteen feet of pliable rubber cord comes with each drill. A special switch mechanism, incorporated in the handle, throws on the power the instant the drill is taken in hand. Jas. Clark, Jr., Inc., Louisville, Ky.



AUT-O-DOR ELECTRIC DOOR CONTROL

The Aut-O-Dor control is a device for opening and closing garage doors and is operated by a one-eighth h.p. motor. The cost installed is $250 and the purpose of the control is to furnish quick opening and closing of doors at night or in the cold weather.

A switch controls the motor and a cord can be extended to any part of the shop where simply pulling such cord will perform the operation. It can be applied to any type of door, sliding, section-hinged or hinged, and operates very rapidly. The Aut-O-Dor requires lubrication about once every six months and an effort must be made to keep the doors in perfect condition. Oiling and greasing of the hinges or sliding rods is necessary.

The feature of the control is the fact that the motor continues in one direction whether opening or closing the doors and the current is controlled by a three-way switch. It is manufactured by the Aut-O-Dor Co., Kentland, Ind.

STANDARD AUTO-LITE FOCUSER

To give the proper adjustment for bulbs in the automobile lights, the Standard Auto-Lite Focuser is made. Fifield Bros. Co., 337 Water St., Augusta, Me.

BESCO PARALLEL GRIP PLIERS

A rubber jar pulling plier. The jaws open and close parallel, utilizing the total surface area of the jaws for handles, compound the leverage, producing a powerful grip with a small amount of pressure. Jaws are replaceable. $1.50. Battery Equipment & Supply Co., 1458 Michigan ave., Chicago.

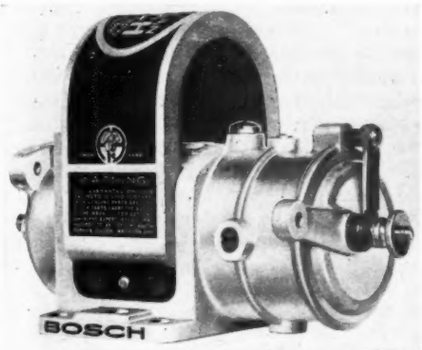
The ACCESSORY SHOW CASE

New Sources of Retail Profit

BOSCH MAGNETO, TYPE FB-1

The "F" types of Bosch Magnetos represent the endeavor of America's finest workmen, the development of more than three years of intensive electrical and magnetic research, and the result of truly ingenious engineering minds. The salient features of these new types are as follows:

They are primarily for one and two-cylinder engines of the farm engine or stationary type. They are of ball bearing construction (except the oscillating type) and their operation may be rotative by gear or the armature may be oscillated by cam or pin action. Either variable or fixed timing may be had; the direction of drive or oscillation may be either clockwise or anti-clockwise; and a Bosch Impulse Coupling may be fitted to the shaft of the rotary machines. Herewith is shown a new Bosch Magneto, known as the FB-1 type. American Bosch Magneto Corp., Springfield, Mass.



AMERICAN HOT WATER HEATER

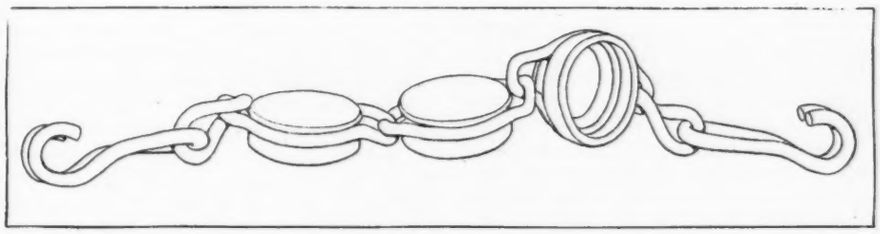
A new system for heating automobiles, buses and trucks is with hot water from the circulating system of the car, instead of with hot gases from the exhaust. This heater is made by the American Water Heater Corp, 2838 West 21st Street, Chicago.

The cylindrical or foot-rail type is 4 inches in diameter and in 18-inch, 22-inch and 26-inch lengths. There are two flush types, called Standard Flush type and De Luxe Flush type. Both the flush types are made of aluminum and the foot-rail types are made from seamless steel.

The system is equipped with a special device that automatically diverts hot water from the radiator to the heater in the body of the car and controls circulation according to the speed of the motor.

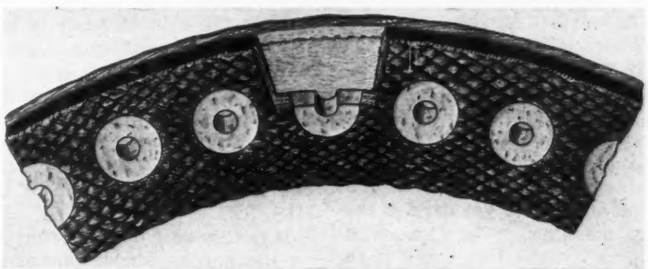
It is claimed that it will heat the car within four minutes after the motor is started.

SUCTION CUP TIRE CHAIN



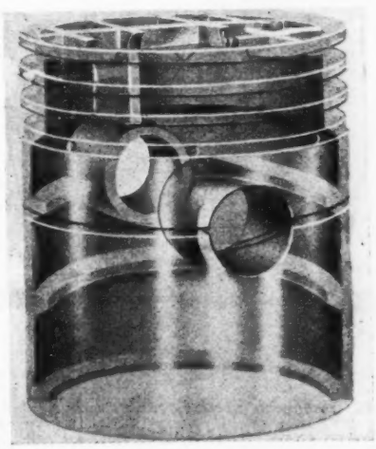
A tire chain designed to get a more positive grip on the road and at the same time present a substantially flat surface against the tire has been brought out recently under the name of the Suction Cup Tire Chain. As will be noted from the illustration the links of the chain merely act as carriers for the metal cups and there is practically no wear on the links. The chain is the product of I. V. Benoit, 1004 Bergen St., Brooklyn, N. Y.

FELTBACK TRANSMISSION LINING FOR FORDS



The construction of this lining incorporates a long fibre cotton fabric into which are inserted cork disks, the latter being provided with oil holes. The disks also are slightly conical in shape so they cannot come out of the fabric. The small end of the disk bears against the transmission drums and as wear takes place it cannot affect the disks. The lining has a felt backing, said to equalize the pressure all the way around the band, insuring smooth action in starting, stopping or using the reverse.

Besides cushioning the action the felt acts as a reservoir for oil splashed up by the flywheel. When braking pressure is applied oil literally flows through the oil holes on the surface of the lining. This oil coming at the time of braking prevents burning or glazing of the surface of the lining. The lining costs $2.75 a set. It is made by the Advance Automobile Accessories Corp., 1721 Prairie Ave., Chicago.



ELMCO PEARLITE SEMI-FINISHED PISTONS

Pearlite semi-finished or lathe finished pistons are furnished in one oversize only, .075. The head is finished and carries a high polish. The oil holes and oiled grooves are properly located and finished. For convenience in machining, the original center is left in the head and the inside of skirt is beveled to a 60 deg. angle. Ring grooves are furnished. The piston pin hole is finished but is .002 to .003 under diameter to insure accurate pin fitting. Nine features of construction are claimed for this piston. The Electric Machine Corp. Indianapolis, Ind.

Barnes, "Barnigrams" and Used Cars

Selling Used Cars Through Newspaper Advertisements Is the Accomplishment of the Barnes Motor Co. of Cleveland, Dodge Dealers

W. Pitt Barnes, president of the Barnes Motor Co., Cleveland, is the author of a "series of unconventional ads pertaining to the used car situation in Cleveland" where he distributes Dodge Bros. cars.

Barnes' advertisements, in themselves, are novel things to which much thought has been given. A real reason for the buyer of used cars to do business with him is given in each announcement. He has succeeded in "getting around" a rather difficult proposition simply by letting himself be known in his own words.

A few of the advertisements which Barnes has used are reproduced on this page. It is Barnes' custom to run one of these announcements every day in a Cleveland paper. He has found this to be "the most effective means of advertising that I have ever engaged in" and "being a firm believer in the powers of advertising," he has tried various means of getting his message to the public.

Barnes' method of talking to the people through advertisements is in an interesting, snappy manner—much after the fashion of the American humorist who gets "his stuff across in the shortest manner possible" and yet carries the weight of a meaning. The American people like brevity—the less there is to a thing, the better they like it and Barnes has capitalized on this characteristic.

It is hard, some dealers think, to write a used car advertisement — perhaps Barnes' method will help in those cases. "The more you tell, the more you sell," is the slogan of a big newspaper and this is true to a certain extent, but, glancing over Barnes' "Barnigrams" it will be seen how easy it is to sell when you tell your story, briefly and with appeal.

So successful was the series which Barnes had written and so many requests for copies of the "ads" which had helped him were received that he selected a number of them and had them printed in book form, calling them by the very fitting name of "Barnigrams." We print the frontispiece of the booklet.

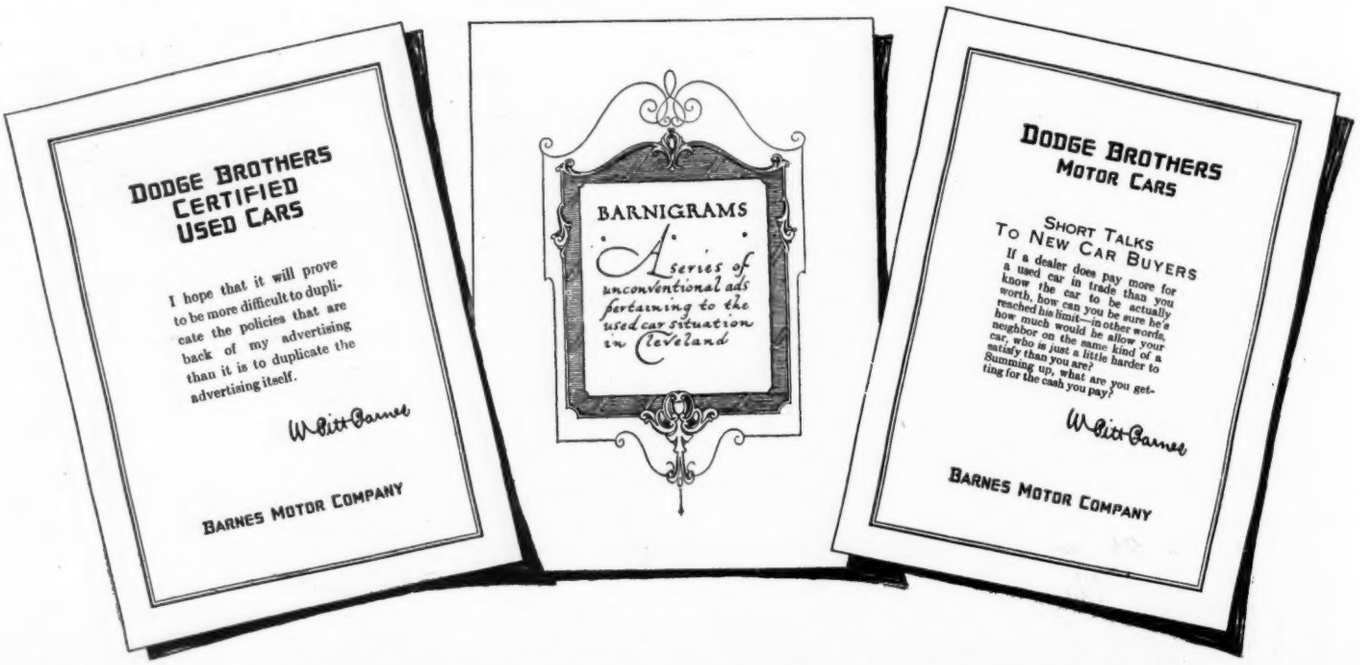
This is handed to prospective used and new car buyers and Barnes is of the opinion that they have helped immeasurably in the sale of many of his cars. In one of the used car announcements, Barnes says, "Bill Haggard is foreman of our used car re-conditioning department. I called him to my office recently and told him that he would be responsible for the condition of every used car offered for sale. HE SAID HE LIKED HIS JOB."

It is this sort of thing that gets a hold on the public—short, snappy and to the point. It gets in idea across or at least prepares the mind of the reader for an idea. In another ad, Barnes tells the public: "I offer my apologies for the many vacant spaces on our used car sales floor last week. Bill Haggard says he can't do them right and get them out any faster. 'All right, Bill,' I answered, 'don't change your standard, put on more men.'"

Here again, there is a directness in the appeal—it relates an incident and imparts a thought. Imagine the effectiveness of one of these ads in a paper every day. Still another message reads, "Chicago has an annual used car show. All exhibitors are required to thoroughly overhaul their cars. They are then examined and certified by a committee of used car managers before being placed on sale.

"We have a used car show daily—Bill Haggard re-conditions, the customer examines and I certify to them. Only trouble is, our customers won't permit us to make any exhibits."

Many other interesting announcements are contained in the booklet, "Barnigrams." "Short talks with new car buyers" is another series for which Barnes is responsible. Barnes throughout makes celar the fact that he and hi sorganization are "sold" on Dodge Bros. and their products. By giving his reasons for being sold, he naturally offers to the public some real, sound reasons for their believing in the product as does he.


DODGE BROTHERS
CERTIFIED
USED CARS
I hope that it will prove to be more difficult to duplicate the policies that are back of my advertising than it is to duplicate the advertising itself.
W Pitt Barnes
BARNES MOTOR COMPANY
BARNIGRAMS
A series of unconventional ads pertaining to the used car situation in Cleveland
DODGE BROTHERS
MOTOR CARS
SHORT TALKS
TO NEW CAR BUYERS
If a dealer does pay more for a used car in trade than you know the car to be actually worth, how can you be sure he's reached his limit—in other words, how much would he allow your neighbor on the same kind of a car, who is just a little harder to satisfy than you are?
Summing up, what are you getting for the cash you pay?
W Pitt Barnes
BARNES MOTOR COMPANY

The frontispiece of Barnes' booklet, "Barnigrams" is shown in the center and two of the "unconventional ads" which appear in the booklet are also printed here. The fine point in such advertising is the brevity and appeal.

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Ottawa, Can.	Central Canada Exhibition	Sept. 8-18
Syracuse, N. Y.	New York State Fair	Sept. 11-16
Cleveland	Closed Car Exhibit—Cleveland Automobile Manufacturers & Dealers' Association	Sept. 18-28
Memphis	Memphis Automobile Dealers' Assn.	Sept. 23-30
New York	Closed Car Show—Automobile Merchants' Association	Sept. 23-30
Detroit	Enclosed Car Solon at General Motors Bldg., Detroit Automobile Dealers' Assn.	Oct. 17-21
Wash'gton, City of	Closed Car Salon	Oct. 21-28
Chicago	Annual Show of the Automotive Equipment Association	Nov. 13-18
Cincinnati, O.	Second Annual Automobile and Radio Exposition	Nov. 23-29
New York	National Automobile Body Builders' Show	Jan. 8-13
New York	Annual Show	Jan. 6-13
Cleveland, O.	Annual Winter Show, Cleveland Automobile M'f'r's. and Dealers' Assn.	Jan. 20-27
Chicago	Annual Show at Coliseum N. A. C. C.	Jan. 27-Feb. 3
Minneapolis, Minn	Annual Show	Feb. 3-10

CONVENTIONS

Toledo, O.	Annual Convention, Ohio Automobile Trades Assn.	September
Buffalo, N. Y.	M. A. M. A. Fall Convention	Sept. 13-15
Chicago	Show Managers' Assn.	Sept. 14-15
Santa Barbara	Annual Convention, California Automotive Trades Assn.	October
Chicago	Nat'l. Association of Farm Equipment Manufacturers	Oct. 18-20

FOREIGN SHOWS

Berlin	Kaiserdamm Hall	Sept. 25-Oct. 3
Rio de Janiero	Automotive Exhibition	Sept., 1922
London	International Commercial Vehicle Exhibition	Oct. 12-13
Paris, France	Automobile Show	Oct. 4-15
London	Annual Show	Nov. 3-11

RACES

Kansas City	Opening Meet of New Kansas City Board Speedway	Sept. 16
San Carlos, Cal.	500-Mile Armistice Day Race	Nov. 11

Back to Sleep

By J. V. M.

A certain service station night man whom we know was
Recently given the job of service manager in the place
He works for, and the story his bosses tell is this:
One night a 'phone call came and the night man was
Asked to bring a gallon of gas to a nearby corner to
Replenish the supply of a car which had gone too low.
He asked the driver why he could not come and get the
Gas himself but was told that the car had no lock on
It and as there were some suspicious looking guys on
The corner, the driver did not think it would be safe.
So the night man locked up and took a gallon of the
Precious fluid to the corner designated and drove
Back with the man. The next day a sale bill for a lock,
Spare tire and carrier was turned in and the bosses
Decided that the night man had no business working
Nights, so now he's working days. This is only luck,
You say and still we had many a night man who would have
Said, "I'm not allowed to leave the garage," and gone
Back to sleep in the boss' private office.

Black & Decker's Display Stand Puts Punch Into Sales By Using Actual Demonstration

The principle that actually demonstration is the most effective sales argument has been recognized by the Black & Decker Mfg. Co. in the development of a jobber's display stand.

For several years this company, which manufactures electric drills and grinders, has supplied jobbers with a display stand. It is a black enamel rack capped with a metal sign bearing the trade mark, in colors, and having pockets for circulars. This rack enabled the jobber to display prominently, on the floor of his store, a representative stock of Black & Decker products. But this did not go far enough. To quote G. W. Brogan, Advertising Manager of the Company:

"We have become convinced that the most important factor in the sale of products such as ours is demonstration. For this reason the 'Bureau of Electric Tools' has been evolved, which provides a substantial work bench on which the units may be actually demonstrated, plus a back piece which carries an assortment of machines on display, as well as pockets for booklets."

These stands are rather elaborate, being made of oak with a waxed finish. The side and front panels consist of colored slides which can be easily removed and replaced with new slides. In this way the display is kept up to date and monotony is avoided.

As may be imagined, this piece of equipment is quite expensive and can be supplied only to jobbers who keep a complete display of Black & Decker stock on display at all times. But for this purpose the company feels that the extra expense is fully justified by increased sales.

Bureau of Electric Tools
BLACK & DECKER
Portable Electric Drills
Bench-Portable Electric Grinders
"With the Pistol Grip and Trigger Switch"
BLACK & DECKER
Portable Electric Grinders
Controlled "With the Pistol Grip and Trigger Switch"

The "Bureau of Electric Tools" made of oak with wax finish and removable colored slides

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Acason	¾–1	$1650a	3¾x5	34x5n	34x5n	W
Acason....RB	1½	1950	3¾x5¼	36x3½	36x6	W
Acason....H	2½	2750	4⅜x5¾	36x4k	36x8k	W
Acason—....L	3½	3450	4⅜x5¾	36x5k	36x10k	W
Acason....M	5	4350	5 x6¼	36x6	40x12	W
Ace....C	1½	2295	3⅜x5½	34x3½k	34x5k	W
Ace....A	2½	2795	4¼x5½	36x4k	36x7	W
Acme....20	1	....	3¾x5	35x5n	35x5n	W
Acme....33	1½	....	3¾x5	34x3½	34x5	W
Acme....40	2	....	3¾x5	34x3½	34x5	W
Acme....60	3	....	4½x5¼	36x4	36x7	W
Acme....60L	3	....	4½x5½	36x4	36x7k	W
Acme....90	4½	....	4½x5½	36x5	40x10	W
Acme....125	6¼	....	4¾x6	36x6	40x12	W
American....25	2½	3350	4 x6	36x4k	36x4dk	W
American....40	4	4275	4½x6	36x5k	36x5dk	W
Armleder....20	1	....	3⅜x5¼	34x3½k	34x6k	W
Armleder....21	1½	....	3¾x5¼	34x3½k	34x6k	W
Armleder....40-B	1½	....	4¼x5½	34x3½k	34x6k	W
Armleder....40-C	1½	....	4¼x5½	34x3½k	34x6k	W
Armleder..HW-B	2½	....	4¼x5½	36x4k	38x7k	W
Armleder..HW-C	2½	....	4½x5¼	36x4k	36x7k	W
Armleder..KW-B	3½	....	4½x6	36x5k	36x5dk	W
Armleder..KW-C	3½	....	4½x5½	36x5k	36x5dk	W
Atlas....MD	1	1185	3½x5	32x4½gn	32x4½gn	W
Atterbury....20R	1½	2175	3⅜x5	31x3½	34x5	W
Atterbury....22C	2½	3375	4¼x5½	36x4	36x4d	W
Atterbury....22C	2½	3375	4¼x5½	36x4	36x4d	W
Atterbury....22D	3½	4375	4¼x5½	36x5	40x5d	W
Atterbury....22D	3½	4275	4¼x5½	36x5	40x5d	W
Atterbury....8E	5	4975	4⅜x6	36x5	40x6d	W
Atterbury....8E	5	5125	4⅜x6	36x5	40x6	W
Autocar....21UF	1½–2	1950	4¾x4½t	34x4k	34x5k	D
Autocar....21UG	1½–2	2050	4¾x4½t	34x4k	34x5k	D
Autocar....27H	2	2950	4 x5½	34x5	36x7	D
Autocar....27K2	2	3075	4 x5½	34x5	36x7k	D
Autocar....26Y	5	3950	4¼x5½	34x6	36x12	D
Autocar....26-B	5	4100	4¼x5½	34x6	36x12	D
Available....H1½	1½	2475	4 x5	36x3½k	36x5k	W
Available....H2	2	2775	4 x5	36x3½k	36x6k	W
Available....H2½	2½	3160	4 x5	36x4k	36x8k	W
Available....H3½	3½	4175	4½x5½	36x5	40x5d	W
Available....H5	5	5375	5 x6	36x6	40x12	W
*Avery	1	....	3 x4s	34x5n	34x5n	I
Beck....A Jr.	1¼	1285a	3½x5	34x4½gn	34x4½gn	I
Beck....B-30	1½	1725	3¾x5	34x5	36x6	
Beck....C-40	2	1810	3¾x5	36x6	36x6	
Beck....D-50	2½	2395	4¼x5¼	38x7	40x8	
*Bell....(Penn.)	½	1000b	3½x5	31x4n	31x4n	B
Bell....M (Iowa)	1	1195	3⅜x5¼	35x5	35x5n	W
Bell....E (Iowa)	1½	2100	3¾x5¼	34x3½	34x5	I
Bell....O (Iowa)	2½	2550	4½x5½	34x4	34x6	I
Bessemer....G	1	....	3½x5	35x5n	35x5n	I
Bessemer....H-2	1½	....	3¾x5	36x3½	36x5	I
Bessemer....J-2	2½	....	4¼x5¼	36x4	36x4d	I
Bessemer....K-2	4	....	4½x5½	36x5	36x10	I
Bethlehem...KN	1	1195	3½x5	35x5n	35x5n	B
Bethlehem....CN	2	1595	4 x3¼	34x4½k	34x6k	I
Bethlehem....HN	3	2195	4 x5¼	36x4k	36x8k	I
Brinton....C	2	2500	3¾x5	34x4	34x5	W
Brinton....D	3	2975	4¼x5¼	36x4	36x7	B
Brockway....E	1	....	3¾x5⅛	35x5n	35x5n	B
Brockway....S-5	1½	....	3¾x5	36x4	36x6	W
Brockway....SK	1½	....	4¼x5¼	36x4	36x6	W
Brockway....KR	2½	....	4¼x5½	36x4	36x8	W
Brockway....K-5	2½	....	4¼x5¼	36x4	36x8	W
Brockway....RT	3½	....	4¾x6	36x5	36x10	W
Brockway....R-4	3½	....	4¼x5½	36x5	36x5d	W
Brockway....T-4	5	....	4¾x6	36x6	40x6d	W
*Buick	½	945b	3⅜x4¾	31x4n	31x4n	B
Case	2	....	4¼x5¾	36x6	38x7	I
*Chevrolet	¼	510b	3⅛x4	30x3½gn	30x3½gn	B
*Chevrolet....G	¾	650	3⅛x4	34x4n	34x4½gn	B
*Chevrolet....T	1	1095	3⅛x5¼	33x4n	35x5n	W
Chicago....C1½	1½	....	4 x5	36x3½k	36x5k	W
Chicago....C2½	2½	....	4 x5	36x4k	36x7k	W
Chicago....C3½	3½	....	4½x5½	36x5	36x10	W
Chicago....D5	5	....	4½x5½	36x6	40x12	W
Clydesdale....10	¼–1½	1485	3⅜x5	34x5n	34x5n	B
Clydesdale....18	¾–1½	1890	3⅜x5	34x5	34x5	W
Clydesdale....20	1–1½	2385	3¾x5	34x5	34x5k	W
Clydesdale....42	1½–2	2475	3¾x5	36x3½	36x6	W
Clydesdale...65X	2½–3	3250	4¼x5¼	36x4	36x8	W
Clydesdale..65EX	2½–3	3450	4½x5½	36x4	36x8	W
Clydesdale....90	3½–4½	4100	4½x5½	36x5	36x10	W
Clydesdale....120	5–6	4500	4¾x6	36x6	40x12	W
Comet....T	1½	1950	3⅜x5	34x4	34x4	W
Commerce....T	¾–1½	1450	3⅜x5	34x4½gn	34x4½gn	B
Commerce....12	1½	1800	3⅜x5	35x5n	35x5n	I
Commerce....16	2	2150	3⅜x5	35x5n	36x6n	I
Commerce....18	2½	2495	4¼x5¼	36x6n	40x8n	I
Commerce....25	2½	2425	4¼x5¼	36x4	36x7	W
Cook....51	2½	3600	4 x5¼	36x6n	40x8n	W
Corbitt....E-22	1	1180	3⅜x5	34x3½	34x4	W
Corbitt....D-22	1½	2200	3⅜x5	34x3½	34x5	W
Corbitt....C-22	2	2600	4¼x5¼	36x3½	36x7	W
Corbitt....B-22	2½	3000	4¼x5¼	36x4	36x7	W
Corbitt....R-22	3	$3200	4½x5½	36x4	36x8	W
Corbitt....A-22	3½–4	3800	4½x5½	36x5	36x10	W
Corbitt....AA-22	5	4500	4¾x6	36x6	40x6d	W
Day-Elder....AS	1	1600	3⅜x5	35x5n	35x5n	W
Day-Elder....B	1½	2000	3⅜x5	34x3½	34x5	W
Day-Elder....D	2	2400	4¼x5¼	36x4	36x7	W
Day-Elder....C	2½	2750	4¼x5½	36x4	36x7	W
Day-Elder....F	3½	3150	4½x5½	36x5	36x5d	W
Day-Elder....E	5	4250	4½x6	36x5k	40x6dk	W
Dearborn....E	1	1600	3⅜x5½	35x5n	35x5n	W
Dearborn....FX	1½	2300	3⅜x5½	34x4	34x5	W
Dearborn....F	1½	2180	3⅜x5½	34x4	34x5	W
Dearborn....48	2	2590	3⅜x5½	34x4½gn	34x7	W
Defiance....G	1	1695a	3⅜x5	35x5n	35x5n	B
Defiance....D	1½	2095a	3⅜x5	35x5n	36x6n	I
Defiance....E	2	2275a	3⅜x5	35x5n	38x7n	I
Denby....31	1¼	1485	3½x5	35x5n	35x5n	B
Denby....33	1½	2145	3¾x5	35x5n	38x7n	I
Denby....34	2	2395	3¾x5	36x3½	36x6	I
Denby....35	2½–3	2795	4½x5¼	36x4	36x7	I
Denby....27	4	3895	4½x5½	36x5	36x5d	I
Denby....210	5	4295	4½x5½	36x6	40x6d	I
Dependable....A	¾–1	1650	3⅜x5½	34x5n	36x6n	W
Dependable....C	2	2350	3⅜x5¼	34x3½	34x5	W
Dependable....D	2½	2650	4 x5½	34x5	36x6	W
Dependable....E	3	2950	4¼x5½	36x4	36x7	W
Diamond T....O-3	1–1¼	1975	3⅜x5¼	36x3½gn	36x4n	W
Diamond T....T	1½	2250	3⅜x5¼	36x3½	36x5	W
Diamond T....U	2–2½	2650	4 x5¼	36x4	36x7	W
Diamond T....K	3½	3750	4¼x5½	36x5	36x5d	W
Diamond T....EL	5	4325	4½x5½	36x6	40x6d	W
Diamond T....S	5	4500	4¾x6	36x6	40x6d	W
Doane	2½	4100b	4¼x5¾	36x5	36x7	C
Doane	3½	5100b	4⅜x5¾	36x5	36x5d	C
Doane	6	6000b	5 x6¼	36x6	40x6d	C
*Dodge Brothers	¾	730	3⅞x4½	32x4n	32x4n	B
Dorris....K-4	2–2½	3400	4¼x5½	36x4	36x7	W
Dorris....K-7	3½	4400	4¼x5½	36x5	36x10	W
*Dort	103	½	685a	3½x5	34x4n	34x4n	B
Double Drive..B	3	4000	4¼x5¼	6	6	W
Duplex....A	2	2775	4 x5¼	35x5n	38x7n	W
Duplex....E	3½	3500	4¼x5½	36x8	36x8	I
Duty....22	2	1590	3½x5	34x3½	34x5	I
Eagle....101	1½	1875	3⅝x5½	34x5	34x5	I
Eagle....100-2	2	2275	3¾x5¼	34x4k	34x7k	I
F. W. D....B	3	4200	4¾x5½	36x6	36x6	B
Fageol....1½	1½	3000	3¾x5½	34x3½k	34x6k	W
Fageol....2½	2½	3900	4¼x5¾	34x4	36x7	W
Fageol....3½	3½	5000	4½x6¼	36x5k	40x5dk	W
Fageol....5	5	5700	4½x5¾	36x6	40x6d	W
Fargo....R	2	1700	3¾x5	36x4	36x6	I
*Federal	1½	1375	3¾x5	—x5n	—x5n	
Federal....SD	1½	1800	3¾x5	35x5n	36x6n	W
Federal....TE	1½	2175	4½x5¼	36x3½	36x5	W
Federal....UE	2–2½	2425	4½x5¼	36x4	36x7	W
Federal....WE	3½–4	3150	4½x5½	36x5	36x5d	W
Federal....X2	5–6	4500	4¾x6	36x6	40x6d	W
*Ford....TT	1	430	3¾x4	30x3½gn	32x4½gn	W
Front Drive....C	1½	2800	3¾x5½	5	4	W
G & J**....20	1	2275	3⅝x5¼	34x5n	34x5n	W
G & J**....A	2–2½	3375	4 x5¼	36x4	36x7	W
G & J**....B	3½–4	4475	4½x5½	36x5	36x10	W
G.M.C....K16	1	1295	3½x5½	31x5n	34x5n	B
G.M.C....K-41A	2	2375	4 x5½	36x4k	36x7k	W
G.M.C....K-41B	2	2375	4 x5½	36x4k	36x7k	W
G.M.C....K-41T	5†	2150	4 x5½	36x4	36x8	W
G.M.C....K-71A	3½	3600	4½x6	36x5	40x5d	W
G.M.C....K-71B	3½	3700	4½x6	36x5	40x5d	W
G.M.C....K-71T	10†	3700	4½x6	30x5	40x12	W
G.M.C....K-101A	5	3950	4½x6	36x5	40x6d	W
G.M.C....K-101T	15†	4050	4½x6	36x5	40x14	W
G.M.C....K-101B	5	4050	4½x6	36x5	40x6d	W
G.W.W	1½	1850	3⅜x5½	35x5	35x5	I
*Garford....15	1	1590	3⅜x5½	34x5n	34x5n	W
Garford....25-B	1½	1990	3⅜x5½	36x3½	36x5	W
Garford....70-H	2½	2750	4¼x5½	36x4	36x8	W
Garford....77-D	4	3750	4½x6	36x5	36x5d	W
Garford....68-D	5	4500	5 x6½	36x6	40x6d	W
Garford....150-A	7½	5200	5 x6½	36x6	40x7d	C
Gary....F	1–1½	1675	3⅜x5	36x3½	36x5	W
Gary....I	2	2250	4 x5½	36x3½	36x6	W
Gary....J	2½	2650	4¼x5½	36x4	36x8	W
Gary....K	3½	3650	4½x6	36x5	40x5d	W
Gary....M	5	4100	5 x6½	36x6	40x6d	W
Gersix....M	1½	3100	4 x5½	36x3½	36x7	W
Gersix....K	2½	$3500	4½x5½	36x4	36x8	W
Gersix....	3½	4500	4½x6	36x5	40x12	W
Graham Bros....	1	1265	3⅞x4½	33x4½gn	34x5n	B
Graham Bros....	1½	1325	3⅞x4½	33x4½gn	36x6n	B
1Gramm-Pion..10	1	1245	3½x5	33x5n	33x5n	B
1Gramm-Pion..15	1½	1750a	3⅜x5	36x3½k	36x5k	I
1Gramm-Pion..65	1½	2250a	3⅜x5	36x3½k	36x5	W
1Gramm-Pion..20	2	2475a	4¼x5¼	36x4k	36x7k	W
1Gramm-Pion..30	3	3300a	4¼x5½	36x4k	36x4dk	W
1Gramm-Pion.75P	3½	4225a	4½x5½	36x6n	42x9n	W
1Gramm-Pion..40	4	3850a	4½x5½	36x5	36x5dk	W
1Gramm-Pion..50	5–6	4450a	4¾x6	36x6	40x6dk	W
Hal-Fur....E	1½	2350	4x5½	34x5n	38x7n	W
Hal-Fur....B	2½	3000	4¼x5½	36x6n	36x8	W
Hal-Fur....F	3½	4000	4½x5½	36x6n	40x10	W
Hall....1½	1½	3100	3⅜x5	34x5n	38x7n	W
Hall....2½	2½	3275	4½x5¼	36x4	36x6	W
Hall....3½	3½	4100	4½x5½	36x5	36x5d	W
Hall....5	5	5100	4½x5½	36x5	40x6d	W
Hall....7 chain	7	5100	4½x5½	36x5	40x6d	C
Harvey....WOA	2	2650	4¼x5½	34x4	34x7	W
Harvey....WFA	2½	2950	4¼x5½	36x4	36x7	W
Harvey....WHA	3½	3950	4½x6	36x5	36x5d	W
Hawkeye....K	1½	1850	3⅜x5½	34x3½k	34x5k	I
Hawkeye....M	2	2650	4¼x5	36x4k	36x6k	I
Hawkeye....N	3½	3700	4½x6¾	36x5k	36x10k	I
Hendrickson...O	1½	2200	3⅝x5½	36x4n	36x5n	W
Hendrickson...N	2½	2690	4¼x5¾	36x4k	36x7k	W
Hendrickson...M	3½	3000	4¼x5	36x5k	36x5dk	W
Hendrickson...K	5	4000	5 x6¼	36x6	40x6	W
Huffman....B	1½–2	1795	3¾x5	34x3½	34x6	W
Huffman....C	1½–2	1695	3¾x5½	36x3½	36x6	I
Huffman....D	2–3	2895	4¼x5½	36x4	36x7	
Hurlburt....A-A	1–1½	1950	3¾x5	34x5n	34x5n	W
Hurlburt....B-B	2–2½	2800	4¼x5½	36x4	36x4d	W
Hurlburt....C-C	3–3½	3475	4¼x5½	36x5	36x5d	W
Hurlburt....D-D	4–4½	4150	4½x6	3 x5	36x6d	W
Hurlburt....E-E	6–6½	4850	4⅝x6½	36x6	40x6d	W
Indep'd't(Iowa) B	1	1665	3½x5	34x3½	34x4	I
Indep'd't(Iowa) G	1½	2040	3⅜x5¼	34x3½	34x5	I
Indep'd't(Ia.).. H1	2½	2940	4¼x5¼	36x4	36x7	I
Indep'd't(Ohio).F	1½	2385	3⅜x5	36x3½	36x5	W
Indep'd't(Ohio) H	2½	3085	4¼x5¼	36x4	36x4d	W
Indep'd't(Ohio) K	3½	3985	4½x5½	36x5	36x5d	W
Indiana....12	1½–2	....	3¾x5¼	34x3½k	34x5k	W
Indiana....20	2	....	4½x5½	36x4k	36x7k	W
Indiana....25	2½–3	....	4½x5½	36x4k	36x8k	W
Indiana....35	3½–4	....	4⅝x5½	36x5k	36x5dk	W
Indiana....51	5–7	....	5 x6¼	36x5k	40x6dk	W
*International..S	1	1250	3½x5	34x5n	34x5n	I
International...21	1	1550	3½x5¼	36x3½	36x3½	I
International...31	1½	1650	3½x5½	36x3½	36x4	I
International...41	2	2100	3½x5¼	36x3½	36x5	I
International...61	3	2400	4¼x5	36x4	36x6	I
International..101	5	3600	4¼x5	36x5	40x10	I
Jackson....4WD	3½	3850	4½x5½	36x7	36x7	B
K-Z....1	1	1750	3½x5	34x3½	34x5	W
K-Z....1½	1½	2075	3¾x5	36x4	36x6	W
K-Z....2½	2½	2550	4½x5¼	36x4	36x8	W
K-Z....3½	3½	3350	4½x5½	36x5	40x10	W
K-Z....5	5	3850	4½x5½	36x6	40x6d	W
Kalamazoo....T	1	1295	4 x5	34x5	34x5n	B
Kalamazoo....G-1	1½	1800	3¾x5	34x4	34x5	W
Kalamazoo....LG	2	2645	4 x5	36x4	36x7	W
Kalamazoo....NH	3	3145	4 x6	36x5	36x10	W
Kalamazoo....HD	3	3350	4¼x6	36x5	36x10	W
Kalamazoo....SK	4	3845	4¼x6	36x5	36x12	W
Kalamazoo....OK	5	4350	4½x6	36x6	40x6d	W
2Kelly-S....K-31	1½	2700	3⅜x5¼	36x3½	36x6	W
2Kelly-S....K-34	1½	2700	3⅜x5¼	36x3½	36x6	W
2Kelly-S....K-38	2½	2900	3⅜x5¼	36x4	36x4d	W
2Kelly-S....K-35	2½	2900	3⅜x5¼	36x4	36x4d	C
2Kelly-S....K-40	3½	3900	4½x6½	36x5	40x5d	C
2Kelly-S....K-41	3½	3900	4½x6½	36x5	36x10	W
2Kelly-S....K-42	3½	3900	4½x6½	36x5	40x5d	W
2Kelly-S....K-50	5	4400	4½x6½	36x6	40x6d	C
2Kelly-S....K-60	6	4600	4½x6½	36x6	40x7d	C
2Kelly-S....K-61	5–7	4800	4½x6½	36x6	36x7d	I
Kimball....AB	2	3675	4 x6	36x4	36x7	W
Kimball....AC	2½	3975	4¼x6	36x4	36x8	W
Kimball....AK	3	4500	4½x6	36x4	36x10	W
Kimball....AE	4	5000	4¾x6	36x5	40x12	W
Kimball....AF	5	5500	5 x6	36x6	40x7d	W
*Kissel..Express	1	1585	3⅞x5½	34x5n	34x5n	W
Kissel....Utility	1½	1975	3⅞x5½	36x3½	36x5	W
Kissel..Freighter	2½	2875	4¼x5½	36x4	36x7	W
Kissel....H. D.	4	3675	4¼x5½	36x5	36x5d	W
Kleiber....AA	1	2200	4¼x5¼	34x3½k	34x5k	W
Kleiber....A	1½	3100	4½x5¼	36x3½k	36x6k	W

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment. b—price includes body. *—express truck or delivery wagon. **—Canadian Make. trac.—tractor. †Capacity with semi-trailer.

1—Gramm-Pioneer. 2—Kelly-Springfield.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Kleiber.....BB	2	$3600	4½x5¼	36x4k	36x7k	W
Kleiber.....B	2½	3950	4½x5½	36x5k	36x8	W
Kleiber.....C	3½	4600	4½x5½	36x5	36x5d	W
Kleiber.....D	5	5300	5 x6½	36x6	40x12	W
Koehler.....D	1½	2150	3½x5	34x3½	34x5	W
Koehler.....M	2½	3175	4 x5½	36x4	36x7	W
Koehler.....MCS	2½	3275	4 x5½	36x4	36x7	W
Koehler.....F	3½	4470	4½x5½	36x5	36x10	W
Koehler,MT. Trac	5	3275	4 x5⅛	36x4	36x7	W
Krebs.....23	¾	1260	3¾x4	34x4½	34x4½	B
Krebs.....24	1	1565	3¾x5	34x5	34x5	W
Krebs.....45	1½	2125	4½x5¼	36x4	36x7	W
Krebs.....75	2½	2375	4½x5½	36x4	36x8	W
Krebs.....110	3½	2975	4½x5½	36x5	40x10	W
Larrabee.....X-2	1	1925	3½x4½	34x5n	34x5n	B
Larrabee.....U	1½	2100	3½x5	34x3½	34x5	W
Larrabee.....J	1½-2	2400	3¾x5	34x3½k	34x5k	W
Larrabee.....K	2½-3	3100	4½x5½	36x4	36x7	W
Larrabee.....K-5	2½-3½	3450	4½x5½	36x4	36x8	W
Larrabee.....L-4	3½-5	4000	4½x5½	36x5	36x5d	W
Larrabee.....W	5-7	4800	4½x6	36x6	40x6d	W
Maccar.....L	1½	....	4½x5½	36x4	36x6	W
Maccar.....H-A	2	....	4½x5½	36x4	36x4d	W
Maccar.....H-2	3	....	4½x5½	36x4	36x5d	W
Maccar.....M-3	4	....	4½x5½	36x5	36x6d	W
Maccar.....G	5 6	....	4¾x6	36x5	40x6d	W
MacDonald.....A	7½	5750	4½x6	40x7	40x14	1
Mack...AB D.R.	1½	3150	4 x5	36x4	36x3½d	C
Mack...AB Chain	1½	3000	4 x5	36x4	36x3½d	C
Mack...AB Chain	2	3300	4 x5	36x4	36x4d	C
Mack...AB D.R.	2	3750	4 x5	36x4	36x4d	D
Mack.....AB D.R	2½	3850	4 x5	36x4	36x4d	D
Mack...AB Chain	2½	3400	4 x5	36x4	36x4d	C
Mack...AC Chain	3½	4950	5 x6	36x5	40x5d	C
Mack...AC Chain	5	5500	5 x6	36x6	40x6d	C
Mack...AC Chain	6½	5750	5 x6	36x6	40x12	C
Mack...AC Chain	7½	6000	5 x6	36x7	40x7d	C
Mack Trac...AB	5	3400	4 x5	36x4	36x4d	C
Mack Trac...AC	7	4950	5 x6	36x5	40x5d	C
Mack Trac...AC	10	5530	5 x6	36x6	40x6d	C
Mack Trac...AC	13	5750	5 x6	36x6	40x12	C
Mack Trac...AC	15	6000	5 x6	36x7	40x7d	C
*Mapleleaf.....**	1½	3000	3¾x5¼	34x5n	36x6n	W
Mapleleaf...AA**	2	3600	4 x5½	36x4	36x7	W
Mapleleaf...BB**	3	4050	4½x5½	36x4	36x4d	W
Mapleleaf...CC**	4	4800	4½x5½	36x5	36x5d	W
Mapleleaf..DD**	5	5625	4½x5½	36x6	40x6d	W
Master.....JW	1½	2290	4½x5½	34x3½	34x5	W
Master.....JD	1½	2590	4½x5½	34x3½	34x5	D
Master.....Z	2	2290	4½x5½	34x3½	34x5	W
Master.....W	2½	2890	4½x5½	34x4	36x7	D
Master.....DD	2½	3190	4½x5½	34x4	36x7	D
Master.....A	3½	3990	4½x6	36x5	40x5d	D
Master.....E	3½	4290	4½x6	36x5	40x5d	D
Master.....Y	4	4490	4½x6	36x5	40x6d	D
Master.....B	5	4990	4¾x6½	36x6	40x6d	W
Master.....F	5	5090	4¾x6½	36x6	40x6d	D
MasterTrac.,DDT	9	3390	4½x5½	34x4	36x7	D
*Maxwell.....1½	1½	932	3⅝x4½	32x3n	32x4n	W
*Menominee.....	1	1650	4 x5	34x5n	34x5n	W
Menominee...HT	1-1½	2000	3¾x5	31x3½	36x5	W
Menominee.....H	1½	2175	4 x5	36x3½	36x5	W
Menominee.....D	2-2½	2875	4 x6	36x4	36x8	W
Menominee.....G	3½	3800	4½x6	36x5	36x10	W
Menominee...J-3	5	4250	4¾x6	36x6	40x12	W
Moline.....10	1½	1985	3½x5	34x5n	36x6n	I
3Moreland...R. R.	1	1595	4 x5	34x5n	34x5n	B
Moreland.....BX	1½	1980	4 x5	36x3½	36x6k	W
Moreland.....EX	2	2800	4½x5½	36x4	36x7k	W
Moreland.....AX	3	3500	4½x5½	36x5	36x10k	W
Moreland.....RX	4½-5	4600	4¼x6	36x6	40x6	W
Nash.....2018	1-1½	1595	3¾x5¼	34x3k	34x4k	1
Nash.....3018	2-2½	2150	3¾x5¼	34x4k	34x7k	1
Nash.....Quad	2-2½	2750	4¼x5½	36x5k	36x5k	1
Nash..3018, LWB	2-2½	2200	3¾x5¾	34x4k	34x7k	1
Nash..Quad. LWB	2-2½	2800	4¼x5½	36x5k	36x5k	1
Nash.....5018	2½	2250	3¾x5¼	34x4k	34x7k	1
4Nelson.....G2	1½	....	4½x5¼	36x3½	36x6	W
4Nelson.....G3	2½	....	4½x5¼	36x4	36x7	W
4Nelson.....G4	3½	....	4½x5½	36x5	36x5d	W
4Nelson.....G5	5	....	4¾x6	36x6	40x6d	W
Netco.....DK	2	3100	4½x5¼	36x4k	36x7k	W
Netco.....HL	2½	3500	4½x5½	36x4k	36x8k	W
Niles.....E	2	3000	4½x5½	36x4k	36x7k	W
Noble.....A21	1¼	1840	3½x5½	34x5	34x5	W
Noble.....B31	1½-2	2480	3¾x5¼	36x4	36x7	W
Noble.....D51	2½-3	2950	4¼x5½	36x4	36x8	W
Noble.....E71	3½-5	3800	4½x6	36x5	36x10	W
Noble.....B30	1½	....	3¾x5¼	36x3½	36x5	W
Noble.....C40	2	....	4 x5½	36x4	36x7	W
Noble.....D50	2½	....	4¼x5½	36x4	36x8	W
Noble.....E70	3½	....	4½x6	36x5	36x10	W
Northwestern..W	1½	2700	4½x5¼	34x4	36x6	W
Northwestern.WS	2½	3500	4½x5½	36x4	36x8	W
Norwalk.....25E	1	1595	3½x5	34x3½	34x4	W
Norwalk.....35E	1½	1925	3½x5	34x3½	34x3½d	W
Norwalk,35E.Spec	1½	2285	3¾x5¼	34x3½	34x5	W
Ogden.....A2	1	....	3½x5	34x5n	34x5n	W
Ogden.....D	1½	....	3¾x5	36x3½	36x5	W
Ogden.....E	2½	....	4½x5¼	36x4	36x8	W
Old Hickory...W	1	$1775	3¾x5	36x3½k	36x4k	W
Old Reliable....A	1½	2350	4 x5	34x4	36x6	W
Old Reliable....B	2½	3500	4¼x6	34x4	36x4d	W
Old Reliable....C	3½	4250	4½x6	36x5	36x5d	W
Old Reliable....D	5	5000	4¾x6	36x6	40x6d	W
Old ReliableKLM	7	6000	4¾x6¼	36x6	40x7d	C
*Oldsmobile Econ	1	1095	3⅛x5¼	35x5n	35x5n	I
Olympic.....A	2½	3200	4¼x5½	36x4	36x8	W
Oneida.....B9	1½	2825	4 x5¼	36x3½	36x7	
Oneida.....C9	2½	3700	4 x5¼	36x4	36x8	
Oneida.....D9	3½	4050	4½x5½	36x5	36x10	
Oneida.....E9	5	4725	4½x5½	36x6	40x12	
Oshkosh.....A	2	3250	3½x5	36x6n	36x6n	B
Oshkosh.....AA	2	3400	3½x5	36x6n	36x6n	B
Oshkosh.....B	2½	3850	4 x5⅛	38x7n	38x7n	B
Oshkosh.....BB	2½	4000	4 x5⅛	38x7n	38x7n	B
*Overland.....4	3½	450	3½x4	30x3½n	30x3½n	B
Packard.....EC	2-3	3100	4½x5½	36x4	36x7	W
Packard.....EX	2-2½	3100	4½x5½	36x6n	40x8n	W
Packard.....ED	3½-4½	4100	4½x5½	36x5	36x5d	W
Packard.....EF	5-7½	4500	5 x5½	36x6	40x6d	W
Paige.....52-19	1½	1950	4 x5¼	34x3½	34x5	W
Paige.....54-20	2½	2420	4¼x5½	34x4	34x8	W
Paige.....51-19	3½	3145	4½x5½	36x5	36x5d	W
Parker.....C-22	1	1875	3¾x5¼	34x5n	34x5n	W
Parker.....G-22	2½	3200	4¼x6	34x4	36x4d	W
Parker.....J-20	3½	3950	4½x6	36x5	40x5d	W
Parker.....M-20	5	4850	5 x6	36x6	40x6d	W
Patriot...Revere	1	1380	3¾x5	35x5n	35x5n	W
Patriot...Lincoln	2	2050	4 x5¼	34x3½	34x5	W
Patriot .Washgt'n	3	2900	4½x5½	36x4	36x7	W
Pierce-Arrow....	2	3200	4 x5½	36x4	36x4d	W
Pierce-Arrow....	3½	4350	4½x6¼	36x5	36x5d	W
Pierce-Arrow....	5	4850	4½x6¼	36x5	40x6d	W
Pittsburgher.....	1½-2	3000	3½x5	36x4	36x6	..
Pittsburgher.....	3	3800	4½x5½	36x5k	36x8	W
Power.....F	2	3150	4 x5½	36x5	36x7	W
Power.....C	3½	....	4½x5½	36x5	40x10	W
Premocar...B-143	1½	2475	3½x5	36x6n	36x6n	W
*Rainier.....R-21	¾	....	3½x5	35x5n	35x5n	W
Rainier.....R-29	1	....	3¾x5	34x3½	34x4	W
Rainier.....R-26	1½	....	3¾x5	31x3½	31x5	W
Rainier.....R-28	2	....	4¼x6	34x4	31x6	W
Rainier.....R-20	2½-3	....	4½x5¼	34x4	31x7	W
Rainier.....R-15	3½-5	....	4½x5½	36x5	36x5d	W
Rainier.....R-17	5-6	....	4¾x6	36x6	40x6d	W
Ranger...TK-20-2	1½	2450	3¾x5	36x6n	38x7n	W
*Reo.....F	¾-1½	1245	4½x4½	31x4½n	31x4½n	B
Reliance.....10A	1½	2100	4 x5½	36x3½	36x5	I
Reliance.....20B	2½	3100	4½x5½	36x4	36x4d	I
Republic.....75	¾	1395b	3½x5	32x4½n	32x4½n	I
Republic.....10	1	1395	3¾x5	34x3	31x4	I
Republic..10 Exp	1	1695	3¾x5	34x5n	31x5n	I
Republic.....11X	1½	1795	3¾x5	31x4	31x6	I
Republic.....19	2½	2195	4½x5¼	36x4	36x7	I
Republic.....20	3½	3095	4½x5½	36x5	36x10	I
Rowe.....CW	1½	3000	3¾x5	36x6n	36x6n	W
Rowe.....C.D.W.	2	3300	4 x5	34x4	36x3½d	W
Rowe.....G.S.W.	3	4150	4 x6	31x5	36x5d	W
Rowe.....G.P.W.	3	5250	3½x5r	38x7n	42x9n	W
Rowe.....HW	4	4500	4¼x6	36x5	36x6d	W
Rowe.....F. W.	5	5500	4½x6	36x6	40x6d	W
Ruggles.....20	1	1195	3¾x5	34x5n	34x5n	B
Ruggles.....40	2	1795	4 x5	34x5n	34x7	D
Samson.....15	¾	....	4-3⅛x4	32x4n	32x4n	B
Samson.....25	1¼	....	4-3⅛x5½	35x5n	35x5n	B
Sanford....W-15	1½-2	2150b	3¾x5	36x3½k	36x5k	..
Sanford.....25	2½-3½	....	4½x5¼	36x4	36x4d	W
Sanford.....35	3½-5	....	4½x5½	36x5	36x5d	W
Sanford.....50	5-7	....	4¾x6	36x5	40x6d	W
Schacht....2-Ton	2	3200	4¼x5½	36x4	36x7	W
Schacht....3-Ton	3	3800	4¼x5½	36x5	36x5d	W
Schacht....4-Ton	4	4200	4½x6	36x5	40x5d	W
Schacht....5-Ton	5	4400	4½x6	36x5	40x6d	W
Schacht....7-Ton	7	5050	4½x6	36x6	40x7d	B
Schwartz.....A	1	1685	3½x5	34x4½n	34x4½n	B
Schwartz.....K	2	3000	3¾x5¼	34x3½	31x7	W
Schwartz.....L	3	3600	4¼x5½	36x4	36x8	W
Schwartz.....M	5	4900	4½x6	36x6	40x12	W
Selden.....30	1½-2½	2250	3¾x5	34x3½	34x5	W
Selden.....31	1½-2½	3350	4½x5¼	34x5a	38x7n	W
Selden.....50	2½-3½	3250	4½x5¼	36x4	36x7	W
Selden.....51	2½-3½	4350	4½x5½	36x6n	40x8n	W
Selden.....70	3½-5	3750	4½x5½	36x5	36x10	W
Selden.....90	5-7	4950	4¾x6	36x6	40x12	W
Seneca.....M	½	820	3½x4½	30x3½n	30x3½n	B
*Service.....12	¾	....	3¼x4½	32x4½n	32x4½n	B
*Service.....15	1¼	....	3½x5	34x4½n	35x5n	B
Service.....21	1½	....	3½x5½	34x3½	34x5	W
Service.....32	2	....	4 x5½	36x3½	36x7	W
Service.....37	2	....	4¼x5½	35x5n	38x7n	W
Service.....52	3	....	4¼x5½	36x4	36x8	W
Service.....72	3½	....	4¼x5½	36x5	36x5d	W
Service.....77	4	....	4½x6	36x5	36x5d	W
Service.....102	6	....	4½x6	36x6	40x6d	W
Signal.....NF	1	$1450	3¾x5	34x5n	36x6n	W
Signal.....H	1½	1950	4½x5¼	34x4	36x6	W
Signal.....J	2½	2375	4½x5¼	34x4	36x8	W
Signal.....M	3½	3175	4½x5½	36x5	40x5d	W
Signal.....R	5	3900	4¾x6	36x6	40x6d	W
*Standard.....75	1¼	1330	3¾x5	33x5n	33x5n	W
Standard.....1-K	1½	1600	3¾x5	34x3½k	34x5k	W
Standard.....76	2½-3	2400	4½x5¼	36x4k	36x7k	W
Standard.....66	3½-5	3150	4½x5½	36x5	36x10	W
Standard.....5-K	5-7	4400	4¾x6	36x6	40x12	W
*Star.....	½	610b	3½x4¼	30x3½n	30x3½n	B
Sterling.....1½	1½	2885	4 x5¼	36x3½k	36x5k	W
Sterling.....2	2	3085	4 x5¼	36x4k	36x6k	W
Sterling.....2½	2½	3290	4¾x5¾	36x4k	36x4dk	W
Sterling.....3½	3½	4325	4½x6¼	36x5k	40x5dk	W
Sterling.....5-W	5	4950	5 x6¼	36x6	40x6d	W
Sterling.....5-C	5	5500	5 x6¼	36x6	40x6d	C
Sterling.....7½	7½	6000	5 x6¼	36x6	40x7d	C
*Stewart...Utility	¼-1¼	1245	3½x5⅛	34-4½n	34-4½n	I
Stewart.....15	1½-1¾	1445	3½x5⅛	35x5n	35x5n	I
Stewart.....9	1½-2	1790	3¾x5	34x3½	34x5	I
Stewart.....7	2-2½	2190	4¼x5½	34x4	34x7	I
Stewart.....7-X	2½-3	2390	4¼x5½	34x4	34x7	I
Stewart.....10	3½-4	3190	4½x5½	36x5	36x5d	I
Stewart.....10-X	3½-4	3190	4½x6	36x5	36x5d	I
*Stewart.....	1¼	1245	4-3⅛x5½	34x4½	34x4½	
*Stoughton.....C	¾	1240	3½x5	34x4½n	34x4½n	B
Stoughton.....A	1	1790	3¾x5½	34x5n	34x5n	W
Stoughton.....B	1½	2150	3¾x5½	34x5n	36x5	W
Stoughton.....D	2	2490	4 x5⅛	36x4	36x7	W
Stoughton.....F	3	3150	4¼x5½	36x5d	36x5d	W
Sullivan.....E	2	2800	4¼x5½	36x4k	36x7k	W
Sullivan.....H	3½	3750	4½x6	36x5	36x5d	W
*Thomart.....	1¼	1795	4 x5¼	34x5	34x5	C
Tiffin.....GW	1½	2100	4½x5½	36x3½	36x5	W
Tiffin.....MW	2½	2700	4½x5½	36x4	36x3½d	W
Tiffin.....PW	3½	3600a	4½x5½	36x5	40x5d	W
Tiffin.....PW	5	4300	4¾x6	36x6	40x6d	W
Tiffin.....UW	6	4500	4¾x6	36x6	40x12	W
Titan.....	2	2750	4 x5	36x4k	36x7k	D
Titan.....	2½	2950	4¼x5½	36x4k	36x8k	D
Titan.....	3½	3950	4½x6	36x5k	40x10k	D
Titan.....	5	4550	4½x6	36x5	40x12	D
Tower.....J	1½	2000	4½x5¼	35x5n	38x7n	W
Tower.....H	2½	2475	4½x5¼	36x4	36x7	W
Tower.....G	3½	3475	4½x5½	36x5	36x5d	W
Traffic.....	1½	1595a	3¾x5	35x5n	35x5n	I
Traffic.....C	2	1595a	3¾x5	34x3½k	34x5k	I
Traffic.....	3	1895a	3¾x5	36x4	36x7	I
*Transport.....15	1	1295	3¾x5	32x4½n	32x4½n	B
Transport.....25	1½	1495	3¾x5⅛	34x3½k	34x4k	I
Transport.....35	2	1885a	3¾x5	36x3½k	36x6k	I
Transport.....55	3	2385	4½x5¼	36x4k	36x8k	I
Transport.....60	3½	2585	4¼x5½	36x4k	36x8k	I
Transport.....75	5	3485	4½x6	36x5k	36x12k	I
Traylor.....B	1½	2390	3¾x5½	31x3½	34x5	W
Traylor.....C	2-2½	2850	4 x5½	36x4	36x7	W
Traylor.....D	3-3½	2300	4¼x5½	36x4	36x8k	W
Traylor.....F	5-6	4700	4½x6	36x6	40x6d	W
*Triangle.....AA	1	1285	3¼x5	31x4½n	34x4½n	I
Triangle.....A	1½-2	1985	3¾x5¼	31x3½k	34x6k	I
Triangle.....C	2-2½	2285	3¾x5¼	36x4k	36x7k	I
Triangle.....B	2½-3	2585	4 x5¾	36x4k	36x7k	I
Twin City...B.W.	2	2750	4 x5½	36x6	40x8	I
Twin City...AW.	3½	3950	4½x6	36x5	40x5d	W
5Twin City.....B	3½	....	5½x6	36x6	36x6	I
5Twin City.....A	5	....	5½x6	36x7	36x7	I
Ultimate.....A	2	3150	4 x5½	36x3½	36x6	W
Ultimate.....AJ	2	3200	4½x5½	36x3½	36x6	W
Ultimate.....AJL	2	3250	4¼x5½	36x3½	36x6	W
Ultimate.....B	3	3700	4½x5½	36x4	36x4d	W
Ultimate.....BL	3	3800	4½x5½	36x4	36x4d	W
Ultimate.....D	5	5500	5 x6½	36x6	40x12	W
United.....A	1½	2145	3¾x5¼	36x3½k	34x5k	W
United.....B	2½	3150	4¼x5½	36x4k	36x7k	W
United.....C	3½	3975	4½x5½	36x5	36x5d	W
United.....V	5	4500	4½x6	36x6	40x6d	W
*United States..U	1¼	1800	3½x5½	34x5n	34x5n	B
UnitedStates,NW	1½-2	2375	3¾x5	36x5	36x3½	W
United States...N	1½-2	2175	3¾x5	36x3½k	36x5k	I
United States...R	3	3300	4 x5¼	36x4	36x4d	W
United States...S	4	4075	4½x5½	36x5	36x5d	W
United States...T	5-7	4975	4¾x6½	36x6	40x6d	W
Velie.....46	1½	1585	3¾x5	36x3½k	36x5k	I
Veteran.....M**	1½	2699	3¾x5¼	35x5n	35x5n	W
Veteran.....P**	2	3699	4¼x5½	36x4	36x7	W
Veteran.....R**	3	4200	4¼x5½	36x4	36x7	W
Veteran.....S**	4	5395	4½x6	36x5	36x10	W
*Vim.....29	1½	1050	3½x4½	31x4n	31x4n	W

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment. b—price includes body. *—express, truck or delivery wagon. **—Canadian Make. trac.—tractor.

3—Moreland Road Runner. 4—Nelson Le Moon. 5—Twin City Four Wheel Drive.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Vim	.30	1½	$1175	3⅛x4½	32x4½	32x1½	W
*Vim	.50	½–¾	995	4 x5	32x4n	32x4n	B
Vim	.31	1	1975	3¾x5⅛	35x5n	35x5n	W
Vim	.22	2	3150	3¾x5⅛	36x4	36x6	W
Vim	.23	3	3950	4¼x5½	36x5	36x5d	W
Walker-JohnsonA		2	2250	3¾x5	34x3½	34x6	W
Walker-JohnsonB		3	2750	4¼x5½	36x4	36x8	W
Walter	.M	2½	3850	4½x5¾	36x4	36x8	D
Walter	.S	5	4850	4½x6¼	36x6	40x6d	W
*Watson	.C	1	1465a	3⅝x5⅛	35x5n	35x5n	W
Watson	.N	3½	4250	4½x5½	36x5	36x10	W
Western	.W1½	1½	2550	4⅛x5¼	36x3½k	36x5k	W
Western	.L1½	1½	2550	3¾x5	36x3½k	36x5k	W
Western	.W2½	2½	3250	4⅛x5¼	36x4	36x7	W
Western	.L2½	2½	3250	4¼x6	36x4	36x7	W
Western	.W3½	3½	4250	4½x6	36x5	40x5d	W
*White	.15	¾	2400	3¾x5½	34x5n	34x5n	B
White	.20	2	$3250	3¾x5½	36x4k	36x7k	D
White	.40	3½	4200	3¾x5¾	36x5	40x5d	D
White	.45	5	4500	4½x5¾	36x6	40x6d	D
White Hick	.E	1	1225	3¾x5	34x5n	34x5n	W
White Hick	.H	1½	1375	3¾x5	36x3½	36x5	W
White Hick	.K	2½	1675	4½x5¼	36x4	36x5	W
Wichita	.K	2	1875	3¾x5¼	36x3½	36x4k	W
Wichita	.M	1	2400	3¾x5¼	36x3½k	36x6k	W
Wichita	.RX	3	3200	4¾x5¾	36x4k	36x8k	W
Wichita	.O	4	$3500	4½x6¼	36x5k	36x5k	W
Wilcox	.AA	1	1900	3¾x5½	36x4k	36x4k	W
Wilcox	.BB	1½	2550	4¼x5	36x4	36x5	W
Wilcox	.D	2½	3000	4¼x5	36x4k	36x3½dk	W
Wilcox	.E	3½	3950	4½x6	36x5k	36x5dk	W
Wilcox	.F	5	4350	4¾x6½	36x5	40x6d	W
Wilson	.F	1½	2270	3¾x5	36x3½	36x5	W
Wilson	.EA	2½	2825	4½x5¼	36x4	36x7	W
Wilson	.G	3½	3685	4½x5½	36x5	36x5	W
Wilson	.H	5	4520	4¾x6	36x6	40x6	W
*Wisconsin	.A	1	1750	3⅜x5	34x5n	34x5n	W,B
Wisconsin	.B	1½	2100	3¾x5	35x5	36x6	W
Wisconsin	.C	2½	2700	4 x5¾	36x6n	36x7	W
Wisconsin	.D	3½	3000	4¾x5¾	36x6n	40x8	W
Wisconsin	.E	5	3500	4½x6¼	36x6	36x10	W
Wisconsin	.F	7	4000	5 x6¼	36x6	36x12	W
Witt-Will	.N	1½	2450	3¾x5	36x3½k	36x5k	W
Witt-Will	.P	2½	2900	4½x5¼	36x3½k	36x7k	W

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl.
d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment, b—price includes body. *—express truck or delivery wagon, **—Canadian Make. trac—tractor.

Specifications of Current Farm Tractor Models

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
Allis-Chal.G.P	6-12	$250	2	LeR.	4-3⅛x4½	Gas.	1
Allis-Chalm	15-25	1185	4	Midw.	4-4½x5¼	Gas.	3
Allis-Chalm	20-35	1885	4	Own	4-4¾x6½	GorK	3-4
‡Allis-Chalm	20-35	2085	4	Own	4-4¾x6½	G	4
Allwork	2-G	14-28	1595	4	Own	4-4¼x6	GorK	3
Allwork	C	14-28	1395	4	Own	4-5 x7	GorK	3
¶ARO.1921-22	3-6	387	4	Own	1-4½x5	Gas.	1
Bitman-T	15-30	1900	4	Clim.	4-5 x6½	G,K	4
Bitman-T	22-45	2830	4	Own	4-5½x8	G,K	6
Bitman-T	30-60	4900	4	Own	4-7 x9	G,K,D	8-10
Automot. B-3	12-22	1250	4	Herc.	4-4 x5½	Gas.	2-3
Avery,SR.Cul	5-10	....	4	Own	4-3 x4	G,K	..
Avery Cult-C		....	3	Own	6-3 x4	G,K	..
Avery	B	5-10	....	4	Own	4-3 x4	G,K	2
Avery	C	....	....	4	Own	6-3 x4	G,K	..
Avery		8-16	....	4	Own	2-5½x6	G,K,D	2-3
Avery		12-20	....	4	Own	4-4½x6	G,K,D	3-4
§Avery		....	....	*	Own	4-4x5½	G,K,D	3
Avery		12-25	....	4	Own	2-6½x7	G,K,D	3-4
Avery		14-28	....	4	Own	4-5½	G,K,D	3-4
Avery		18-36	....	4	Own	4-5½x6	G,K,D	4-5
Avery		25-50	....	4	Own	4-6½x7	G,K,D	5-6
Avery		45-65	....	4	Own	4-7¾x8	G,K,D	8-10
Bates Mule	H	15-25	....	4	Midw	4-4½x5¼	Gas.	3
Bates Mule	F	18-25	....	*2	Midw	4-4½x5¼	Gas.	3
‡Bates MuleG		25-35	....	*2	Midw	4-4½x6	Gas.	..
Bear		25-35	4250	*2	Ste.	4-4¾x6½	Gas.	4
¶Beeman	G	2-4	240	4	Own	1-3½x4½	Gas.	..
Best		30	....	*2	Own	4-4¾x6½	G,K,D	4
Best		60	....	*2	Own	4-6½x8½	G,K,D	8-9
Boring		5-10	395	4	LeR.	4-3⅛x4½	G	..
Boring	1921	.....	1850	3	Wauk	4-4⅜x5¾	GorK	2
*Bryan		15-30	....	4	Own	2-4 x5	K.	3
Capital		15-30	1000	2	Own	4-4¼x6	Gas.	3
Case		12-20	1050	4	Own	4-4½x5	G,K,D	3
Case		12-20	....	....	....	4-4½x5	....	2
Case		15-27	1320	4	Own	4-4½x6	G,K,D	3-4
Case		22-40	2550	4	Own	4-5½x6¾	G,K,D	4-5
Case		40-72	5200	4	Own	7 x8	G,K,D	8-10
Caterpillar T35		15	....	*2	Own	4-4 x5½	Gas.	3
Caterpillar .5T		25	....	*2	Own	4-4¾x6	Gas.	4
Caterpillar 10T		40	....	*2	Own	4-6½x7	Gas.	6
Centaur		5-21½	345	2	N Way	2-4½x4½	GorK	1
Chicago	40	40	2500	4	Own	4-4½x6	Gas.	4
Clitrac	F	9-16	595	*2	Own	4-3½x4½	G,K,D	2
Clitrac	W	12-20	1345	*2	Own	4-4 x5½	G,K,D	2-3
Dakota	4	15-27	1500	3	Dom.	4-4¾x6	Gas.	3
Depue	A	20-30	2500	4	Buda	4-4½x6	Gas.	4
Dill	D	20	2380	4	Cont.	4-4½x5½	Gas.	3
Dill	R.W.	20	2980	4	Midw.	4-4½x6	Gas.	3
Do-It-All	A	3-6	495	..	Own	1-4½x5	Gas.	1
Eagle	F	12-22	....	4	Own	2-7 x8	GorK	3-4
Eagle	H	16-30	....	4	Own	2-8 x8	G or K	4-5
Eagle	AA	12-20	1095	4	Own	4-4¾x5	G,K,D	3
Fageol	D	9-18	1525	4	Lve.	4-3½x5	Gas.	2
Farm Horse	B	18-30	1885	4	Clim.	4-5 x6½	G,K	4
Farquhar		15-25	....	4	Buda	4-4½x6	G,K,D	3-4
Farquhar		18-35	....	4	Own	4-6 x8	G,K,D	4-5
Farquhar		25-50	....	4	Own	4-7 x8	G,K,D	6-7
Fitch	4 Drive	20-35	1850	4	Clim.	4-5 x6½	GorK	3-4
Fordson		-18	$ 395	4	Own	4-4x5	G,K	2
Franklin	G	13-30	4000	*2	Clim.	4-5 x6½	G or K	3-4
Franklin	C	18-30	3350	*2	Clim.	4-5 x6½	G or K	3-4
Franklin	G2	18-30	4350	2	Clim.	4-5 x6½	G or K	3-4
Frick	A	12-20	....	4	Erd.	4-4 x6	G,K	2-3
Frick	C	15-28	....	4	Beav.	4-4¾x6	G,K	3-4
Grain Belt	A	18-30	2150	4	Wauk.	4-4¾x6¾	G or K	4
Gray		20-36	1975	3	Wauk.	4-4½x6¾	Gas.	4
Gray		22-44	2165	3	Wauk.	4-5 x6¾	Gas.	4-5
Gt. Western St		20-30	1950	4	Beav.	4-4¾x6	K	4
Hart-Parr	20	20	765	4	Own	2-5¼x6½	K,D.	2
Hart-Parr	30	30	895	4	Own	2-6½x7	K,D.	3
‡Hart-Parr		....	1695	4	Own	6½x7	K.D.	..
Heider	D	9-16	870	4	Wauk	4-4¼x5½	G,K	2
Heider	C	12-20	995	4	Wauk	4-4½x6¾	G,K	3
Heider	Cult	5-10	800	4	Lelt.	4-3½x4½	Gas.	1
Huber Light 4		12-25	985	4	Wauk	4-4½x5¾	G or K	3
Huber Super 4		15-30	1885	4	Midw	4-4½x6	Gas	3
Illinois	C	15-30	....	4	Clim.	4-5 x6½	G,K	4
Indiana	F	5-10	665	2	LeR.	4-3½x4½	Gas.	1-2
International		8-16	†670	4	Own	4-4¼x5	G,K,D	2
Internatl.Titan		10-20	†700	4	Own	2-6½x8	G,K,D	3
International		15-30	1750	4	Own	4-5½x8	G,K,D	4
J-T	N	25-40	3000	*2	Clim.	4-5x6½	G,K,D	3-4
¶Kinkade		1½	190	1	Own	1-3 x3	Gas.	....
La Crosse		12-24	985	2	Own	2-6 x7	G,K	3
Lauson	5	12-25	1295	4	Midw	4-4½x5½	Gas.	3
Lauson	21	15-30	1675	4	Beav.	4-4¾x6	G or K	3-4
‡Lauson Road		15-30	2000	4	Beav.	4-4¾x6	K	....
Leader	B	12-18	685	4	Own	2-6 x6½	G,K,D	2-3
Leader	N	16-32	1725	4	Clim.	4-5 x6½	G,K	3-4
‡Leader	GU	18-35	2150	*2	Clim.	4-5 x6½	G,K	3-4
Linn	H4J	40-	4500	*	Cont.	4-4½x5½	Gas	4
Linn	W	60	5000	*	Wauk	4-5 x6¼	Gas	6
Little Giant	B	16-22	2200	4	Own	4-4½x5	K	4
Little Giant	A	26-35	3300	4	Own	4-5½x6	K	6
Lombard	1922	85-150	8950	*2	Wisc.	6-5½x6¾	Gas.	16
Lombard	1922	50	5300	*2	Wisc.	4-4¾x6½	Gas.	6-10
MerryGar1922		2	210	2	Evin	1-2¾x2½	Gas.	..
Minne	All-P	12-25	800	4	Own	4-4½x7	G or K	3
Minne	Gen.P	17-30	1600	4	Own	4-4¾x7	G or K	3-4
Minne	Med.D	22-44	2650	4	Own	4-6 x7	G or K	5-6
MinneHeavyD		35-70	3850	4	Own	4-7½x9	G or K	8-9
Mohawk	1922	8-16	650	2	Light	4-3½x4½	K or G	1-2
Moline Univ D		9-18	650	2	Own	4-3½x5	Gas.	2-3
Moline Orch		9-18	....	2	Own	4-3½x5	Gas.	2-3
‡Monarch		20-30	3500	*2	Beav.	4-4¾x6	G,K,D	4
Motor Macult		1½	195	2	Own	1-2¾x3½	Gas.	..
NB	I	3-6	425	4	Own	2-3⅜x4	Gas.	1
Nichols-Shep		20-42	2650	4	Own	8 x10	G or K	3-6
Nichols Shep		25-50	3000	4	Own	9 x12	G or K	4-7
Nichols-Shep		35-70	3650	4	Own	-10½x14	G or K	8-10
Nilson Senior		20-40	1975	5	Wauk	4-5 x6¼	G,K	4
Oil Pull	K	12-20	....	4	Own	2-6 x8	K,D	3
Oil Pull	H	16-30	....	4	Own	2-7 x8½	K,D	4
Oil Pull	G	20-40	....	4	Own	2-8 x10	K,D	5-6
Oil Pull	E	30-60	....	4	Own	2-10x12	K,D	8-10
¶Oldsmar	K	2½–5	$225	4	Own	1-5½x5½	Gas.	1
Peoria	L	12-25	1600	4	Clim.	4-5 x6½	G,K	3
Pioneer	G	18-36	1750	4	Own	4-5½x6	G,K,D	4
Pioneer	C	40-75	3550	4	Own	4-7 x8	Gas.	10
Plowman	A	15-30	1295	4	Buda	4-4½x6	G,K	3-4
Reliable		10-20	390	4	Own	2-6 x7	Ker.	2
Rex		12-25	1600	4	Wauk	4-4¼x5¾	G or K	3
Russell		12-24	1500	4	Own	4-4¼x5¾	G or K	2-3
Russell		15-30	2200	4	Own	4-5 x6½	G or K	3-4
Russell		20-35	3000	4	Own	4-5½x7	G or K	4-5
Russell		30-60	5000	4	Own	4-8 x10	G or K	8-10
Samson	M	....	445	4	Own	4-4 x5½	G,K	2
Sandusky	J	10-20	1250	4	Own	4-4¼x5¾	G,K,D	2
Sandusky	E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
¶Shelby		1	150	3	B & S	1-2½x2½	G	..
Shelby	D	15-30	....	4	Beav.	4-4¾x6	G,K	3
Shelby	C	9-18	....	4	Wauk	4-3¾x5¼	G or K	2
Steady Pull		12-21	1485	4	Own	4-4 x5	Gas.	3
Tioga	3	18-32	....	4	Wisc.	4-4½x6	Gas.	3-4
Toro Cultivator		6	750	3	LeR	4-3⅛x4½	Gas.	2
ToroTractor'22		6-10	495	3	LeR	4-3⅛x4½	Gas.	2
Townsend		10-20	800	2	Own	4-6½x7	Ker.	2-3
Townsend		15-30	1350	2	Own	4-7 x8	Ker.	3-4
Townsend		25-50	2500	2	Own	4-8½x10	Ker.	4-8
Traction Motor		40-50	....	4	Own	8-3½x5	Gas.	4-5
Traylor	TB	6-12	500	4	LeR.	4-3⅛x4½	Gas.	1-2
Trundaar	10	25-40	3750	*2	Wauk	4-5 x6¼	G or K	4
Twin City		12-20	1200	4	Own	4-4¼x6	G,K	3
Twin City		20-35	2750	4	Own	4-5½x6¾	G,K	5-6
Twin City		40-65	4750	4	Own	4-7¾x9	G,K	8-10
Uncle Sam C20		12-20	1295	4	Weid.	4-4 x5½	G	2-3
Uncle Sam B19		20-30	1985	4	Beav.	4-4¾x6	G or K	3-4
Uncle Sam D21		20-30	1895	4	Beav.	4-4¾x6	G or K	3-4
Utilitor	501	2½-4	295	4	Own	1-3½x4½	G	1
Utilitor	501A	2½-4	340	4	Own	1-3½x4½	G	1
Wallis	K	15-25	....	4	Own	4-4½x5¾	G,K	3
Waterloo	N	12-25	675	4	Own	2-6½x7	Ker.	3
Wetmore 21-22		12-25	1185	4	Wauk	4-4 x5¾	G,K	3
Whitney	D	9-18	595	4	Own	2-5½x6½	Gas.	2
Wichita	T	15-30	2000	4	Beav.	4-4½x6	G,K,D	3-4
Wisconsin	E	16-30	1850	4	Clim.	4-5 x6½	G or K	3
Wisconsin	F	20-40	2050	4	Wauk	4-5 x6¼	G or K	4
Wisconsin	H	22-40	2550	4	Clim.	4-5½x7	G or K	4-6
Yuba	12-20	12-20	2400	*2	Wisc.	4-4½x6¾	G,K,D	..
Yuba	15-25	15-25	2750	*2	Wisc.	4-4¼x6	G,K,D	..
Yuba	20-35	20-35	3900	*2	Wisc.	4-5¾x7	G,K,D	4
Yuba	25-40	25-40	4250	*2	Wisc.	4-5¾x7	G,K,D	..
‡Yuba		25-40	4750	*2	Yuba	4-5½x7	D	..
Zelle		12-25	....	4	Buda	4-4¼x5½	G or K	3

ABBREVIATIONS: G—Gasoline. K—Kerosene. D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14 in. plows. Engine Make: Beav.—Beaver. B & S—Briggs & Stratton. Clim.—Climax. Cont.—Continental. Dom.—Domas Evin.—Evinrude. Herc.—Hercules. LeR.—Leltoy. Midw.—Midwest. Nway.—New Way. Nor.—Northway. Ste.—Stearns. Wauk.—Waukesha. Weid.—Weidely. Wis.—Wisconsin. *—Crawler type. All others are wheel type. †Price includes plows §Track Runner. ‡Industrial Tractor. ¶Garden Tractur. **Steam Tractor

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"The Backbone of Automotive Service" is a booklet that tells how to increase shop profits. Gives useful hints on selection of machine tool equipment. Sent free. Write for a copy.

The one thing that the well equipped shop and the not-so-well-equipped shop have in common is that both are paying for good mechanical facilities.

The difference is that the first shop gets what it pays for, and the other doesn't.

If you are turning profits over to a machine shop, or losing business because you haven't the resources to handle it, or doing by hand what the proper machine would have done twice as quickly and twice as well, you are **spending good money** that would have fitted your shop out with up-to-date equipment. Your own day book tells the story.

It is easy to stop this condition. It is easy to get the right equipment, since you are paying for it anyway. And any shop proprietor who has it will tell you how profitable it is.

The Quick Way to Put on a Stop Light

Mark the position of the bolt holes on the fender, and then drill them. Your electric light current can attend to this part of the job. You just guide the drill—and it's all done before you could have much more than started the first hole with the old hand method. The rest is easy. And it doesn't do a bit of harm to have the car owner see you doing the efficient, **modern** way.

THE JACOBS MFG. COMPANY, HARTFORD, CONN.

This advertisement inserted in the interest of better Service Equipment in general and the use of Portable Electric Drills in particular

"Serve Well With Good Equipment"

Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ambassador.....R	Cont..	6-3⅝x5¼	136	33x5	....	b4500	$4500	....	$6500
American.....D-66	H-S...	6-3½x5	127	33x4½	b1885	1785	1850	....	2485
Anderson...Aluminum 6	Cont..	6-3½x4¼	114	32x4	....	1195	....	....	....
Anderson.....Series 40	Cont..	6-3¼x4½	120	33x4	1495	1495 / b1595n	1595	$1995	1995
Apperson.....8-21-S	Own..	8-3¼x5	130	34x4½	....	2620	2645	3625	3695
Auburn.....6-51	Cont..	6-3⅜x4½	121	32x4	1575	1475	....	2275	2345
Auburn.....6-51	Cont..	6-3⅜x4½	121	32x4½	....	n1995	1545	....	....
Bay State.....	Cont..	6-3¼x4½	121	32x4	1800	1800	....	2400	2500
Biddle.....B1 & B5	Buda..	4-3¾x5⅛	121	32x4	2950	b2950	....	3950	3950
Brewster.....91	Own..	4-4 x5½	125	32x4½	5000	5000	....	....	7000
Buick..1922-34-5-6-7-38	Own..	4-3⅜x4¾	109	31x4	865	885	u 725	1175	1395 / 1325c
Buick....1922-41-4-5-47	Own..	6-3⅜x4½	118	33x4t	1175	1195	u975	1935c	1985
Buick..1922-48-9-50-4-55	Own..	6-3⅜x4½	124	34x4½	n1625v	n1675v	1435	1895	2195
Cadillac.....61	Own..	8-3½x5⅛	132	33x5	3100	3150	3150	b3875	4100
Case.....X	Cont..	6-3⅜x4½	122	32x4½	1750	1790	....	2550	2690
Case.....W	Cont..	6-3⅝x5¼	129	34x4½	....	2200	2250	2850	3250
Chalmers.....1922	Own..	6-3¼x4½	117	32x4	1185	1185	....	1595	2295
Chalmers.....1922	Own..	6-3¼x4½	122	32x4	....	....	1345	....	....
Chandler.....Six	Own..	6-3½x5	123	33x4	1495	b1495	1645	b1995	2295
Chevrolet.....Superior	Own..	4-3 1/16x4	102	30x3½	510	525	u425	b840 / k680	860
Chevrolet.....FB	Own..	4-3 1/16x5¼	110	33x4	865	885	....	1325	1395
Cleveland.....41	Own..	6-3 x4½	112	32x4	1085	1095	n1260	1495	1585
Cole.....890	Nort..	8-3½x4½	127¼	33x5	2685	b2685n	2685	b3385	3685
Columbia.....De Luxe	Cont..	6-3⅜x4¼	115	32x4	1475	1475	b1475n	b1925	1995
Columbia.....Light Six	Cont..	6-3½x4¼	115	31x4	995	985	....	....	1395
Comet.....C-53	Cont..	6-3½x5¼	125	33x4½	....	1985	2085	....	2985
Courier.....	Own..	6-3¼x4½	116	32x4	a1395 / a1495n	1395	b1495n	2065	2165
Crawford.....22-6-60	Cont..	6-3⅝x5¼	122½	32x4	3000	3000	3000	....	4500
Crawford-Dagmar...6-60	Cont..	6-3⅝x5¼	135	33x5	....	n3500	....	....	....
Daniels.....D-19	Own..	8-3½x5¼	132	33x5	a4350	b4350	4350	5250	6000
Davis.....71	Cont..	6-3½x4¼	114	31x4	....	1295	....	....	....
Davis.....61-67	Cont..	6-3⅜x4½	120	32x4	1595	1595	b1695	2095	2195
Dixie Flyer.....H-S-70	H-S..	4-3½x5	112	32x4	1175	1175	b1295	1515	1595
Dodge Brothers.....	Own..	4-3⅞x4½	114	32x4	850	880	....	980h	1440
Durris.....6-80	Own..	6-4 x5	132	33x5	....	b3900	3950	4985b	5750
Dort.....19-14	D-Ly..	4-3½x5	108	31x4	885	885	....	1265 / 1015k	1385 / 1095k
Driggs.....	Own..	4-2⅝x4½	104	30x3½	1275	1275	....	....	1975
Duesenberg...Straight 8	Own..	8-2⅞x5	134	33x5	6500	6500	6750	7800	7800
Du Pont.....A	Own..	4-3½x5⅛	124	32x4½	3000	3200	....	3800	4000
Durant.....A-22	Cont..	4-3⅞x4¼	109	31x4	n890	890	....	1365	1365
Durant.....B-22	Anst..	6-3¼x4½	123½	32x4½	1600	1650	....	2250	2400
Earl.....40	Own..	4-3 x5¼	112	32x4	1485	1095	950u	b1395	1795
Elcar.....K-4	Lyc..	4-3½x5	118	33x4	1095	1095	n1095	1315	....
Elcar.....7-R	Cont..	6-3½x4½	118	33x4	1395	1395	n1395	2065	2165
Elgin.....K-1	Falls..	6-3½x4¼	118	33x4	1345	1295	b1345	1695	1695
Essex.....	Own..	4-3⅜x5	108½	32x4	....	1095	....	1155k	1895 / 1295k
Ford.....T	Own..	4-3⅛x4	100	30x3½	r319	s348	u285	580	645
Franklin.....9-B	Own..	6-3¼x4	115	32x4	1900	1950	u1750	2750	2850
Gardner.....T-R & G	Lyc..	4-3½x5	112	32x4	895	895	....	1095k	1595 / 1315k
Grant.....	Walk'r	6-3½x4½	116	32x4	1385	1385	....	1895	1945
Gray.....	Own..	4-3⅜x4	100	30x3½	....	490	....	....	760
H.C.S.....Series 3	Weid..	4-3⅝x5½	120	32x4½	2475	2475	....	3250	3475
Halladay.....4	Own..	4-3½x5	115	32x4	1095	1095	....	1990	2085
Halladay.....6	Own..	6-3½x5	115	32x4	1595	1595	....	2295	2395
Handley-Knight.....	Own..	4-4½x4½	125	32x4½	....	....	2650	3450	3450
Hanson.....30	Cont..	6-3½x4¼	114	31x4	....	995	....	....	....
Hanson Six.....60	Cont..	6-3⅜x4½	121	32x4	1595	1595	1795	b2475	2585
Hatfield.....A-42	H-S..	4-3½x5	115	32x4	....	1345	b1345	1950	1950
Haynes.....75	Own..	6-3½x5	132	34x4½	2395	b2395	2395	....	3395
Haynes.....55	Own..	6-3½x5	121	32x4½	1545 / 1895n	1195 / 1895n	....	2095 / 2195n	2395 / 2695n
Holmes.....Series 4	Own..	6-3½x4¼	126	34x4½	....	b2500	2500	b3300	3600
Hudson.....Super 6	Own..	6-3½x5	126	34x4½	....	b1645	1695	2570	2650 / 1745k
Huffman.....	Cont..	6-3⅜x4½	120	32x4	1395	1395	....	....	2295
Hupmobile.....Series R	Own..	4-3¼x5½	112	32x4	1150	1150	u1025	1635 / 1335k	1785
Jackson.....638	Cont..	6-3¼x4½	121	32x4½	....	1485	b1685	2985	2985
Jewett.....Six	Own..	6-3¼x5	112	31x4	a995	995	....	b1445	1465
Jordan.....MX	Own..	6-3 1/16x4¾	120	32x4	1895	1795	....	2785	2785
Jordan.....	Own..	6-3 1/16x4¾	124½	32x4	....	b2150n	....	....	....
Kelsey.....4	Gray..	4-3½x5	111	32x3½	....	985	....	....	1450
Kelsey.....6	Walk'r	6-3½x4½	118	32x4	....	1525	....	....	2175
Kenworthy.....8-90	Own..	8-3 x5¼	130	32x4½	5000	5000	5250	6000	6000
King.....K	Own..	8-3 x5	120	32x4½	1795	1795	b1795	2400	2550
Kissel.....45	Own..	6-3 1/16x5½	124	32x4½	n2385	1885	2385	b2975	3075
Kline Kar.....6-55-K	Cont..	6-3⅝x4½	121	33x4	1690	1690	1690	2750	2890
LaFayette.....	Own..	8-3¼x5¼	132	33x5	3985	b4090	4090	5500	5500
Leach.....999	Own..	6-3¾x5¼	134	32x4½	5500	5500	5500	5500	5500
Lexington.....23	Anst..	6-3¼x4½	128	32x4½	1695	1695 / 2045n	1795	b2345	2515
Liberty.....10-D	Own..	6-3½x5	117	32x4	1575	1395	1575n	2085 / 1695k	2215

NAME AND MODEL	Engine Make	Cylinders Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Lincoln.....	Own..	8-3⅜x5	136	33x5	$3800	b3800	$3800	$4400	$4700
Locomobile.....48	Own..	6-4½x5½	142	35x5	....	b7600	7600	10500	11000
Marmon.....34	Own..	6-3⅜x5⅛	136	32x4½	3385	b3185	3185	3985	4385
Maxwell.....	Own..	4-3⅝x4½	109	31x4	885	885	....	1235	1335
McFarlan.....1922	Own..	6-4½x6	140	33x5	6300	b6300	6300	7500	7500
Mercer.....Series 5	Own..	4-3¾x6¾	132	32x4½	3950	b3950	c3950	4850	5250
Merit.....	Cont..	6-3¼x4½	119	32x4	1895	1895	....	....	....
Mitchell.....F-50	Own..	6-3½x5	120	32x4	a1490	1590	b1690	b2050	2275
Mitchell.....F-50	Own..	6-3½x5	127	32x4½	....	....	1850n	....	....
Monroe.....1922-S-9	Own..	4-3¼x4½	115	32x3½	950	950	....	....	....
Moon.....6-40	Cont..	6-3½x4¼	115	31x4	....	1295	....	....	1695
Moon.....6-58	Cont..	6-3⅜x4½	128	33x4½	1725	1785	1785	2785	2785
Nash.....691-96-97	Own..	6-3¼x5	121	33x4	1210	1240	b1395n	....	2040
Nash.....692-94-95	Own..	6-3¼x5	127	34x4½	....	....	1390	b1890	2190
Nash Four.....41-4	Own..	4-3⅜x5	112	33x4	915	935	....	a1385 / 1195k	1545 / 1275k
National.....BB	Own..	6-3½x5¼	130	32x4½	a2475	b2475	2375	b3725	3825
Noma.....3C	Cont..	6-3¼x4½	128	32x4½	2500	b2500	c2600	....	3500
Noma.....1D	Bea...	6-3½x5¼	128	32x4½	3000	b3100	c3200	....	5500
Norwalk.....430-KS	Lyc...	4-3½x5	116	32x3½	....	1035	....	....	....
Oakland.....6-44	Own..	6-2 11/16x4¾	115	32x4	975	995 / u795	b1165n	b1445 / 1185k	1545
Ogren.....6 T D Luxe	Cont..	6-3⅝x5¼	134	33x5	b3750	3750	3850	4500	4800
Oldsmobile.....43 A	Own..	4-3 11/16x5¼	115	32x4	1095	1095	b1225n	1595	1745
Oldsmobile.....46	Own..	8-2⅞x4¾	122	33x4½	b1735	c1850	1735	....	2635
Oldsmobile.....47	Own..	8-2⅞x4½	115	32x4	1495	1495	b1725n	1995	2145
Overland.....4	Own..	4-3⅜x4	100	30x3½	550	550	....	850	895
Packard.....Single-Six	Own..	6-3⅜x5	126	33x4½	2485	2485	u2250	3175	3275
Packard.....Single-Six	Own..	6-3⅜x5	133	33x4½	....	u2350	2685	....	3525
Packard.....Twin-Six	Own..	12-3 x5	136	35x5	3850	3850	3850	5240	5400
Paige.....6-44	Own..	6-3½x5	119	32x4	1465	1465	u1290	1995	2245
Paige.....6-66	Cont..	6-3⅜x5	131	33x4½	a2495	n2245	2195	3100	3155
Paterson.....22-6-52	Cont..	6-3⅜x4½	120	32x4½	....	1390	1425	2395	2395
Peerless.....56-S-7	Own..	8-3¼x5	138	33x5	....	b2990	2900	b3400	3900
Pierce-Arrow.....	Own..	6-4 x5½	138	33x5	5250	b5250	5250	6800	7000
Pilot.....6-50	H-S..	6-3¼x5	126	32x4½	2050	2000	2050	2950	3000
Premier.....6-D	Own..	6-3⅜x5½	126¾	33x5	3150	b3100	3250	4300	5100
Premocar.....6-40-A	Falls..	6-3½x4¼	117	32x4	1095	1095	....	1750	1825
R & V Knight.....R	Own..	4-3¾x5	116	32x4	....	1665	....	2385	2475
R & V Knight.....J	Own..	6-3½x4½	127	32x4½	2475	b2475	2475	3015	3105
Reo Series.....T6 & U6	Own..	6-3⅝x5	120	33x4	1595	n1645	1485	b2355	2435
ReVere.....C	Dues.	4-4¼x6	131	32x4½	3200	3200	3200	....	4000
Rickenbacker.....A	Own..	6-3⅜x4¾	117	32x4	....	1485	....	1885	1985
Roamer.....6-54-E	Cont..	6-3½x5¼	128	32x4½	2850	b2585	2785	3850	3850
Roamer.....4-75-E	Dues.	4-4¼x6	128	32x4½	3985	b3585	b3750n	....	b4650
Rolls-Royce.....	Own..	6-4½x4¾	143½	33x5	....	10,900	....	....	....
Saxon.....125	Own..	4-3½x5	112	32x4	1195	1195	....	1795	1795
Sayers Six.....DP	Cont..	6-3¼x4½	118	33x4	1645	1645	....	2645	2645
Seneca.....L-2 & O-2	Lyc...	4-3½x5	108	30x3½	875	875	....	....	....
Seneca.....50 & 51	Lyc...	4-3½x5	112	31x4	1095	1095	....	....	....
Sperling.....A	Supr..	4-3⅜x5	114	32x4	980	980	....	1685	1685
Standard.....98	Own..	8-3¼x5	127	34x4½	2150	b2500	2500	2750	3200
Stanley.....	Own..	2-4 x5	130	32x4½	2700	2700	2700	3775	3950
Stanwood Six.....	Cont..	6-3¼x4½	118	33x4	1765	1765	....	2750	....
Star.....	Cont..	4-3½x4¼	102	30x3½	r319	s348	u285	580	645
Stearns-Knight....SKL4	Own..	4-3¾x5⅝	125	34x4½	2250	2250	2450	3150	3450
Stearns-Knight.....6	Own..	6-3⅜x5	130	34x4½	2700	2700	2850	3350	3700
Stephens.....90	Own..	6-3¼x4½	122	33x4½	1575	b1595	c1625	2450	2550
Stevens-Duryea.....E	Own..	6-4 7/16x5½	138	35x5	7250	b6900	6800	u5600	b8900
Studebaker....Light Six	Own..	6-3½x4½	112	32x4	975	975	u785	1225	1550
Studebaker..Special Six	Own..	6-3½x5	119	32x4	1250	1275	b1275	1875	2050
Studebaker.....Big Six	Own..	6-3⅞x5	126	33x4½	u1300	1650	n1785	2275	2475
Stutz.....	Own..	4-4⅜x6	130	32x4½	2450	b2790	c2640	3490	4450
Templar.....A-445	Own..	4-3⅜x5½	118	32x4	2025	2125	b2175	2650	2785
Tulsa.....E-1-2-3	H-S..	4-3½x5	117	33x4	1175	1175	....	....	....
Velie.....48	Cont..	6-3¼x4½	115	32x4	1585	1585	b1800	2485	2485
Velie.....34	Falls..	6-3½x4½	112	32x3½	1235	1235	....	1750	2085
Velie.....58	Own..	6-3½x4¼	115	32x4	1275	1275	....	2185	2185
Washington.....C	Cont..	6-3⅜x4½	120	32x4	....	1785	....	....	2285
Westcott.....C-48	Cont..	6-3½x5¼	125	32x4½	....	....	1890	....	2890
Westcott.....A-44	Cont..	6-3¼x4½	120	32x4	....	1690	n1890	....	2690
Wills Sainte Claire..A-68	Own..	8-3¼x4	121	32x4½	2475	2475	....	3275	3475
Willys-Knight.....20	Own..	4-3⅜x4½	118	32x4	1350	1375	....	1875	2095
Winton.....40	Own..	6-3¾x5¼	132	35x5	3400	n3600	3400	b4450	4550

a—3-passenger. b—4-passenger. c—6-passenger. n—Sport. h—All Metal Type. k—Soft Top Type. u—Chassis Price. r—Price without starter and demountable rims. Price with starter and demountable rims $414. s—Price without starter and demountable rims. Price with starter and demountable rims $443. t—Model 47-34x4½ Tires. v—Tire Sizes 32x4½. e—Touring Sedan.

Engine Make: Anst—Ansted. Bea—Beaver. Cont—Continental. Curt—Curtis. D.Ly—Dort Lycoming. G-B—Grey Beal. H-S—Herschell-Spillman. Lyc—Lycoming. Nort—Northway. Roch—Rochester. Rut—Rutenberg. Supr—Supreme. Weid—Weidely. Wisc—Wisconsin